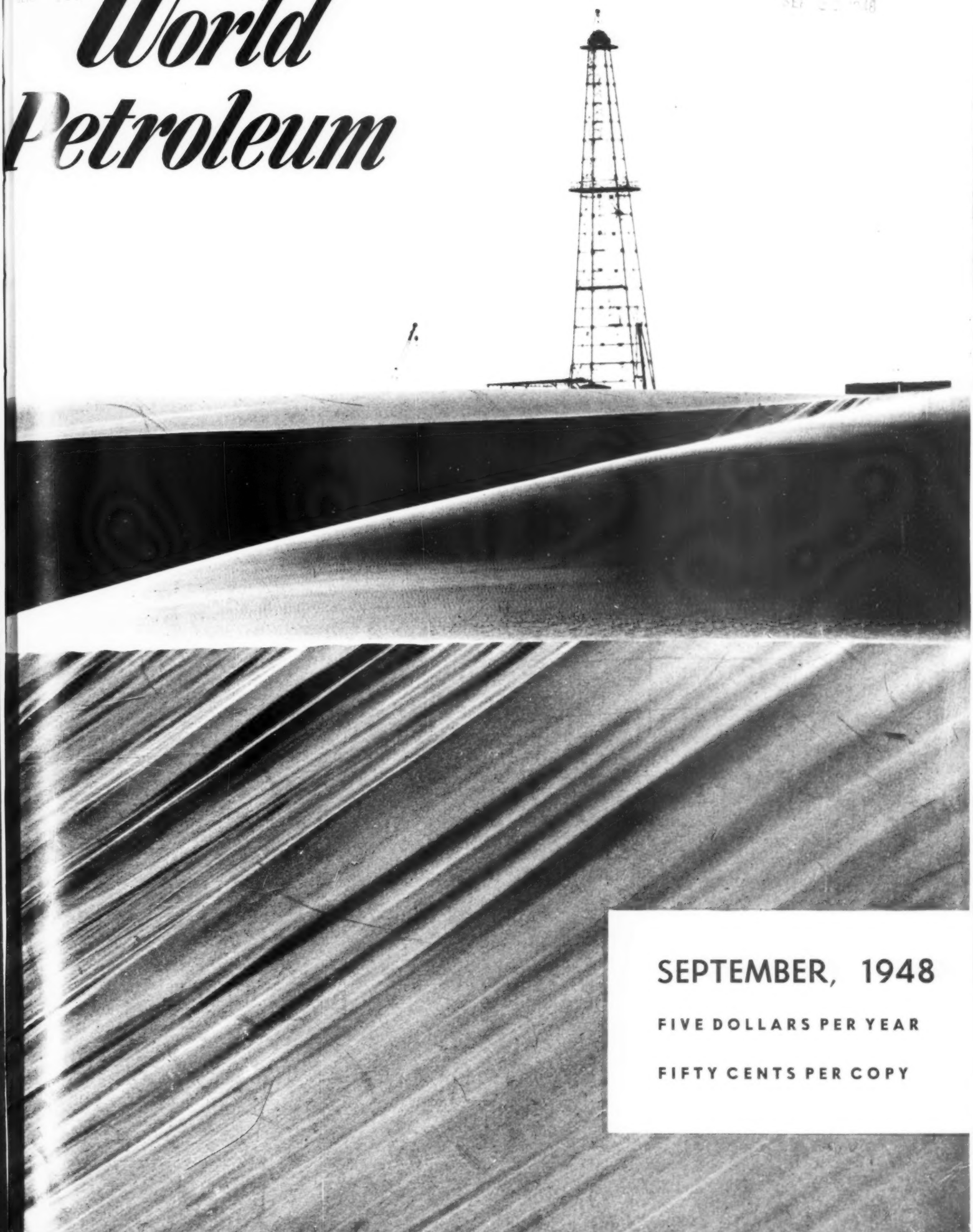
World Petroleum



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THIS MONTH'S COVER—One of the 35 producing wells in the Abqaiq field in Saudi Arabia. Shifting sand of the dunes has presented no difficulties thus far in operation of producing wells although there has been some trouble in keeping roads clear of sand for easy operation of motor vehicles. Photo by Corsini for Arabian American Oil Co.

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EDITORIAL

CHANGING ECONOMY OF THE OIL INDUSTRY

SWIFT moving developments in the three years since the close of World War II have radically changed the conditions under which the world oil industry must operate. So rapid has been the pace of this transformation that many members of the oil industry itself fail to realize that what is taking place is not a temporary manifestation but the opening of a new era which will affect its course for years to come.

Outstanding among these changes has been the tremendous rise in demand for petroleum products. As everybody knows, World War II was fought on oil and imposed hitherto undreamt-of demands upon the industry. It likewise made the whole world oil conscious as never before so that cessation of heavy military requirements brought no more than a momentary pause in the upward swing of demand. In 1947 the increase in consumption over the preceding year was ten percent in the United States and at a still higher rate in other parts of the world. In the first half of 1948 the growth in demand as compared with the corresponding period of the year before has been maintained, although in many countries drastic restrictions are still imposed upon use of oil products.

The lesson of the time is that petroleum has come to be recognized as the very foundation of modern industrial progress and a primary factor in the improvement of living standards. This has not come about suddenly to be sure, but is a movement that has been under way for years and that was given added impetus by World War II. From the beginning of the present century oil and its associated product, natural gas, have steadily increased their prportional share of the total energy employed in industry measured in Btu's, while the share supplied by coal has as steadily declined. In 1946 the point was reached in the United States where the energy supplied by oil and gas surpassed that derived from coal. In the rest of the world coal still supplies over 80 percent of all energy as against 20 percent for water power, oil and gas, but the movement toward the latter is steadily progressing, an indication that the demand for oil as a source of heat and power will continue at an increasing rate in all these areas.

Not only has demand established itself on a new and higher plateau, but notable changes are taking place in the relative importance of different products. For many years the efforts of the refining industry were concentrated on recovering more and more gasoline from each barrel of crude. With the rapid multiplication of motor vehicles gasoline was most in demand. Now a number of factors have combined to stimulate a heavy demand for products within the range classed as middle distillates. Most important of these factors has been the great expansion in the use of fuel oil for home and industrial heating. At the same time the adoption by railway lines and industrial plants of diesel power to replace coal has called for large quantities of this fuel. In the first half of the current year the increase in distillate demand over the six months of 1947 was over 20 percent as compared with a 10 percent gain for gasoline. This change in the relative position of distillate fuels marks a trend that seems certain to continue and involves a modification of refining operations to meet the rising curve of fuel oil demands.

The sharp rise in worldwide demand is having its effect upon the supply situation and bringing about changes in the transportation routes over which oil travels in its course from producer to consumer. This year is witnessing the change of the United States from an exporting nation to a net importer. Rising consumption in other importing countries of the western hemisphere is absorbing more of the output of the Caribbean area. The only region in a position to supply readily the needs of western Europe is the Middle East, and the production of that area may be expected to increase rapidly in the next few years.

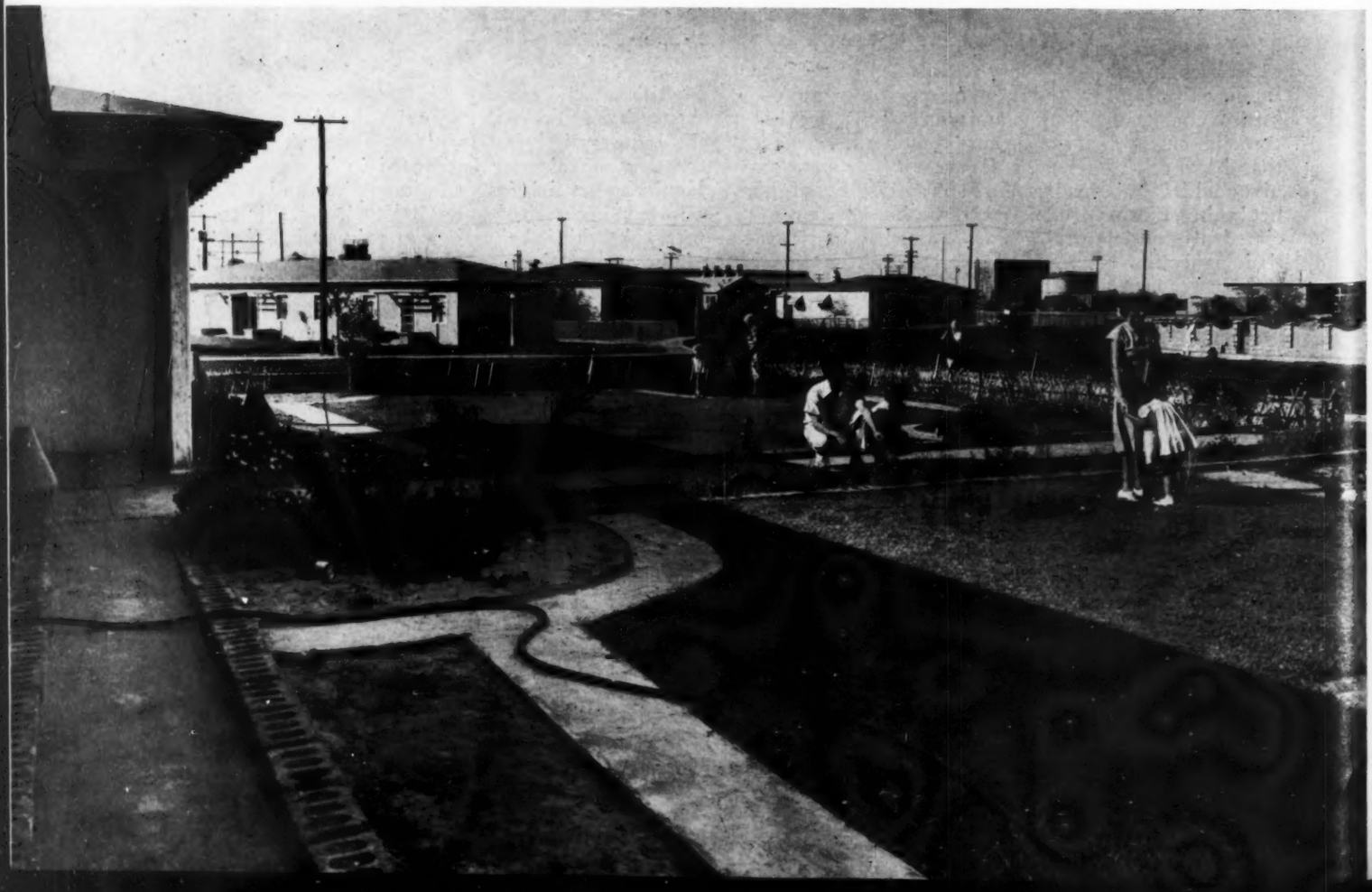
Significant changes are taking place within the industry itself. To keep pace with the rise in demand, the industry is being forced to undertake expenditures on a scale unprecedented in its past history. Exploration, drilling, transportation and refining all are being pushed to the limit of available equipment. All this is being done at a time when the costs of these operations are double or triple what they were in the prewar period. The cost of drilling an average well has risen from $20,000 to $85,000 in that period. The investment in refinery equipment to produce a gallon of refined product was nine dollars a decade ago; now has mounted to thirty-five dollars according to a recent statement by President Fraser of Shell-Union Oil Company.

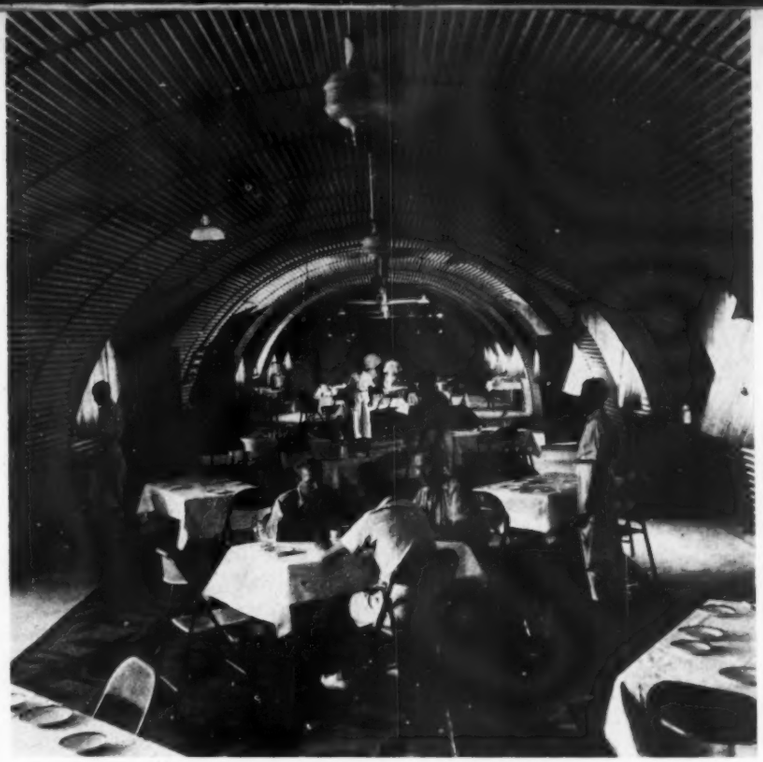
While the majority of oil companies have been reporting incomes well above those of other recent years, these earnings are due to the fact that they have been selling goods that they acquired far below current replacement cost. To maintain their positions they must be able to obtain prices as high or higher than those that now prevail. Since the money that goes into the drilling of a well, the laying of a pipeline or the building of a refinery is a permanent investment of capital, the outlook is that the industry in future will operate on a higher cost level than in the past and that the price of its products will not decline but may well go higher.

MID-EAST BECOMING HUB OF INTERNATIONAL OIL

One of the main gates to the walled city of Kuwait.

Home of E. C. Singelyn, Aramco accounting executive at Dhahran, Saudi Arabia. Corsini photo.





Drillers' messhall for Kuwait drillers. The company now is running seven rigs.

DESPITE interruptions due to the war and later to political disturbances and inability to obtain prompt delivery of equipment, development of the oil resources of the Middle East is making steady progress. Production during the first six months of the current year has risen above a million barrels daily, gaining a full 25 percent over the corresponding period of 1947. Substantial gains in output have taken place in every country within the area, with the exception of Iraq where the enforced shutdown of one branch of its bifurcated pipeline to the Mediterranean resulted in a small temporary decrease. Increases in other districts aggregated over 200,000 barrels per day.

Iran remains the leader among Middle Eastern countries in point of production with a daily production now running close to a half million barrels. Development in Iran has followed a balanced program with field extension proceeding in step with the enlargement of transport and refining facilities. In the ten-year period 1938-1947 production in Iran doubled. As the drilling program for 1948 provided for an increase of 50 percent over last year, the rise in output should continue as the majority of the fields are capable of much further expansion.

One of the noteworthy developments of the present year in Iran is the building of a new pipeline from the Agha Jari field to Bandur Mashur, a deep-water port on the Kohr Musa at the head of the Persian Gulf. This line, of 20-22-inch diameter, served by 8-10-inch gathering lines, will permit the delivery of an additional 100,000 barrels of crude daily to ocean-going tankers for movement overseas. Of this amount 40,000 barrels are contracted to Socony-Vacuum Oil Company, and it is expected that the remainder will be sold for shipment to the United States. So important was this undertaking regarded by the Office of International Trade in Washington in adding to the immediate supply of the country that a permit for export of steel required in construction of the line was granted at a time when such authorizations were being withheld in other cases.

Under an agreement by which Anglo-Iranian has undertaken to supply large quantities of oil to Standard Oil Co. (N. J.) and Socony-Vacuum, the Mid-East Pipe Line Company was organized to build a pipeline from Abadan to a Mediterranean port, probably Latakia. Like the other lines planned for this area, the line will be of large diameter with a daily capacity of around 500,000 barrels. Since the company is fully organized and financed, the line undoubtedly will be put under way at the earliest possible moment, though the chances of its completion by 1951, the date originally proposed, may be problematical.

Second to Iran in the length of time during which its fields have been in active operation is Iraq. Oil from Iraq entered the world market in 1934 on completion of Iraq Petroleum Company's bifurcated pipeline to Tripoli and Haifa on the eastern shore of the Mediterranean. Since this line was the only available outlet, production has been limited to its daily capacity of 96,000 barrels, although the wells of the Kirkuk field from which its supply is drawn are capable of a much higher output. They have in fact the largest sustained average flow of any group of producers in the world, about 8,000 barrels daily, so that a dozen wells have been able to fill the pipeline.

To handle a larger part of the field's higher potential, the Iraq Pipeline Company is now engaged in enlarging its capacity. First step in this procedure, which is now well advanced, is the laying of an additional line of 16-inch pipe paralleling the existing system and raising daily capacity to 300,000 barrels. The new line is scheduled for completion early next year, and production will be stepped up to its capacity. Looking beyond this early increase, a third line is projected to consist of 30-32-inch pipe and will add another 350,000 barrels daily to Iraq's outturn. This line is still in the planning stage and is tentatively set for completion in 1951. Realization of this goal will depend upon the availability of the large-diameter pipe required for its construction.

On the Arabian peninsula the first substantial oil development was that at Bahrein, a group of small islands lying close offshore in the Persian Gulf. The first cargo of oil from Bahrein was shipped in 1934. First production was from shallow wells of 2,000 - 2,500 feet, but subsequently a second zone was located at 4,000-4,500 feet, from which the main part of the output now comes. The field is small in area and currently yields around 35,000 barrels daily. One of the important assets of Bahrein Petroleum Company is its refinery which has a daily throughput of about 115,000 barrels and cracking capacity of 65,000 barrels. In addition to processing local crude, it refines crude from nearby mainland fields.

Saudi Arabia came into the Middle East picture in 1938 when Dammam No. 7, following inconclusive earlier tests, was brought in with a large flow of high gravity test oil. Subsequent discoveries at Abqaiq, Qatif, Abu Hadriya and just recently at Ain Dar have marked this as a region tremendously rich in oil. Some 40-odd wells have been drilled, and production has risen steadily from the time of the initial discoveries to roundly 330,000 barrels daily at present. A refinery erected by Arabian-American Oil Company at Ras Tanura has attained a throughput of 130,000 barrels daily and proved itself of great value during the latter part of the late war in providing fuel for Allied fleets operating in Eastern waters.

To make Arabian oil more readily available to western markets, the company, through its subsidiary, the Trans-Arabian Pipeline Company, undertook the construction of a pipeline to extend from Abqaiq to Sidon, Lebanon, on the eastern shore of the Mediterranean, a distance of 1,050 miles. This line, of 30-31-inch diameter, was designed to handle initially 300,000 barrels daily and to have an ultimate capacity of 500,000 barrels. Construction of the line was started in July 1947 and has continued since, though recently the rate of progress has been slowed by the refusal of the Office of International Trade to authorize the shipment of line pipe which the company had on order and ready to move. This is another manifestation of the shortage of steel which is restricting oil industry expansion in many parts of the world. The company, however, has been able to continue work on the line using pipe which it had on hand and has completed about 65 miles at the Arabian end of the system. As a result of the inability to obtain scheduled deliveries of pipe and uncertainty as to events in the immediate future, the route of the line has been changed slightly. Instead of extending directly from Abqaiq in a straight line toward Sidon, it proceeds by way of Qatif and Abu Hadriya so that the portion of the line already built can be used to convey oil from the

fields to the refinery at Ras Tanura instead of moving it in the opposite direction.

First section of the line, from Abqaiq to Qatif, about 30 miles in length, went into service in May last. Construction is now going forward on the section between Qatif and Abu Hadriya, a distance of 110 miles.

Work on the main section of the line is to be pushed as fast as supplies become available, but the date for completion originally fixed as 1949 has been rendered uncertain by the interruption of deliveries and may be affected also by political unsettlement in the area which the line traverses. Meanwhile, efforts are being made to provide additional tanker tonnage to move oil to waiting markets.

Lying between Iraq and Saudi Arabia at the northwestern end of the Persian Gulf is the small Sheikdom of Kuwait, about 50 miles square, which is believed by geologists who have studied it to contain the greatest oil deposits of any like area in the world. Kuwait has been under development for several years through the joint efforts of Gulf Oil Corporation and Anglo-Iranian Oil Co., Ltd. Its output first entered the market about a year ago when production had reached 40,000 barrels daily. It has now risen to more than double that figure, averaging 110,000 barrels daily during the month of June. Plans of Kuwait Oil Company include a pipeline of large diameter with a capacity of 500,000 barrels or more per day, to extend from its Burghan field to an undetermined terminal on the Mediterranean. This line is not to be built immediately but is projected for possible completion by 1952. Of the ability of Kuwait's wells to fill it by that time there can be no doubt.

Latest entrant in the Middle East oil arena is the American Independent Oil Company owned by a group of nine American oil companies. Some two months ago it obtained from the Sheik of Kuwait a concession covering his rights in the so-called Neutral Zone lying between Kuwait and Saudi Arabia over which the rulers of these two countries claim joint domain. According to report an agreement will be concluded with Arabian - American, which holds a concession from King Ibn Saud covering his share of the Neutral Zone, so that exploration may proceed. A possible pipeline from this area to the Mediterranean figures in future plans of American Independent, assuming of course that sufficient oil is found in the territory.

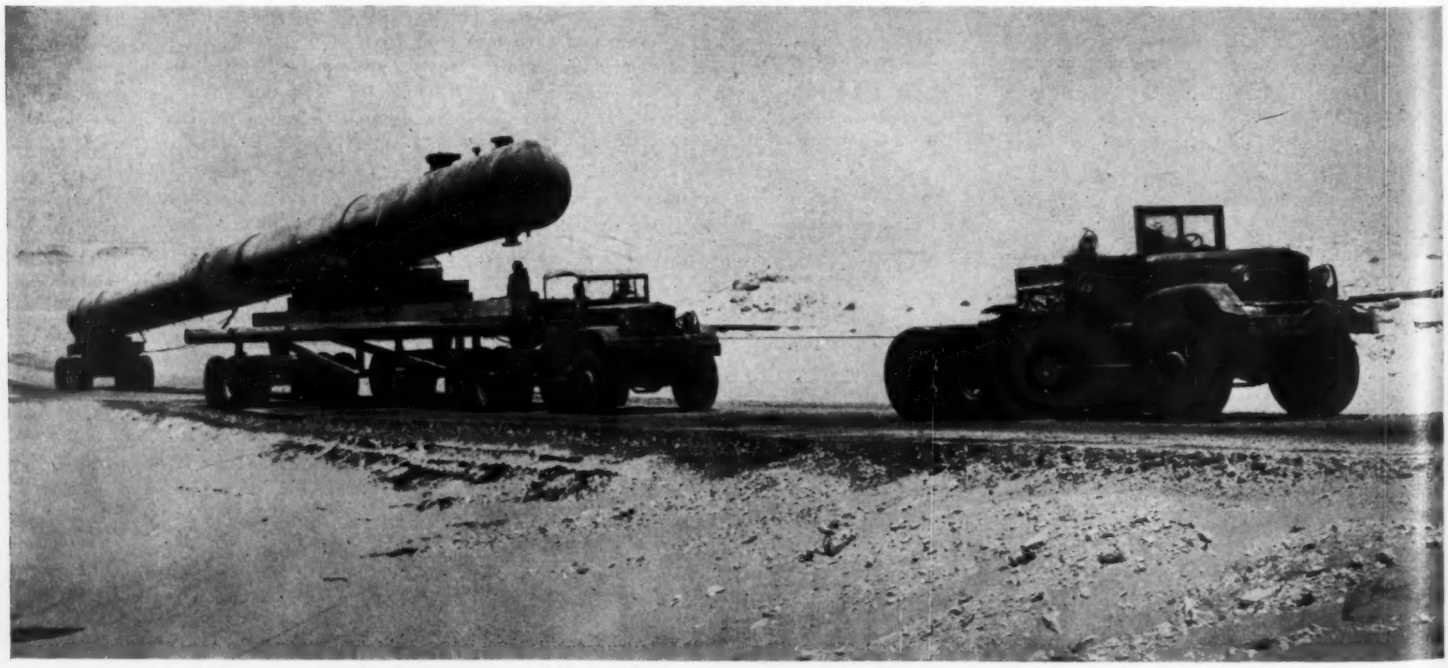
A number of concessions lying within the Middle East are held by companies associated with Iraq Petroleum Company and having the same ownership. These concessions include all of the Kingdom of Iraq except that held by the parent company, Qatar on the eastern side of the Arabian peninsula where substantial production already has been obtained, Oman and Dhofar, the Trucial Coast, Hadramaut, a portion of Western Arabia, Transjordan, a section of Palestine, Syria and Lebanon. Exploratory tests in several of these districts were started early in the present year, but work in most cases has been suspended temporarily because of political disturbances.

Thus it appears that at a most conservative estimate the Middle East will be supplying 1,600,000 barrels of oil daily to world markets and that by 1952 at the latest, this quantity of Middle Eastern oil will be delivered by pipeline to the eastern shore of the Mediterranean in an advantageous position to supply Western Europe and, if need be, other countries across the Atlantic. By that time Middle East production will have increased to a point where it can still supply its established markets east of Suez without interference with this westward flow.

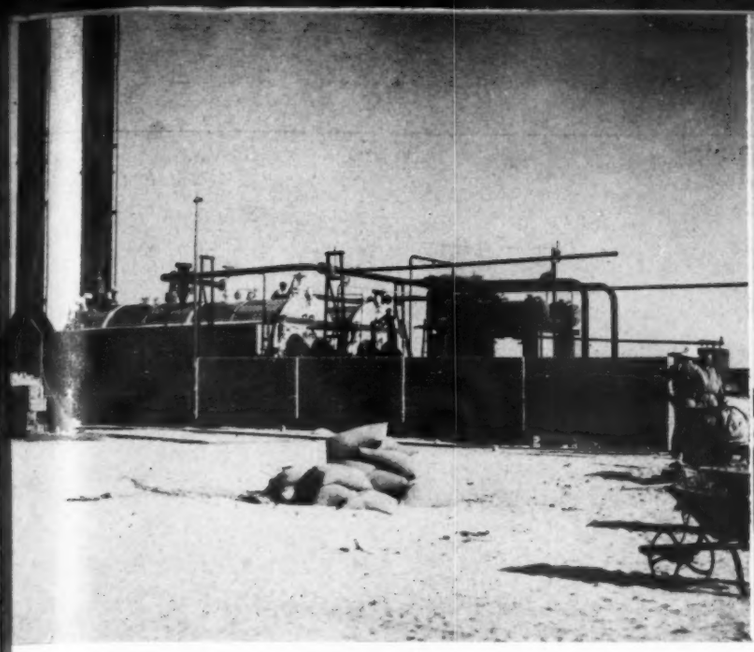
Inasmuch as small shipments of Middle East oil already are moving to North and South America, notwithstanding the long ocean voyages involved, there is every reason to believe that these quantities will become larger as the changes now under way take effect. Imports to the United States from this source of 100,000 to 200,000 barrels daily by 1950 would not be surprising. There is no likelihood, however, that this movement will interefre seriously with the progressive development of the industry in the Western Hemisphere, as a glance at the probable demand picture will reveal.

There is no present indication of any let-up in the growth of demand for petroleum products. In 1947 world production increased 10 percent over the preceding year. In the first six months of the current year the gain over the corresponding period of 1947 has been 13 percent. Still the supply situation the world over can only be described as tight, though in the United States it is perhaps a shade less tight than it was a year ago. Even with a 50 percent decline in the current rate of growth in demand, which is scarcely to be expected, requirements by the year 1951 will be pushing 10.5 million barrels daily. Should the rate of growth established during the past two years be maintained, demand would reach a daily requirement of 11.5 million barrels. Possibly an average of the two figures may be nearer the mark.

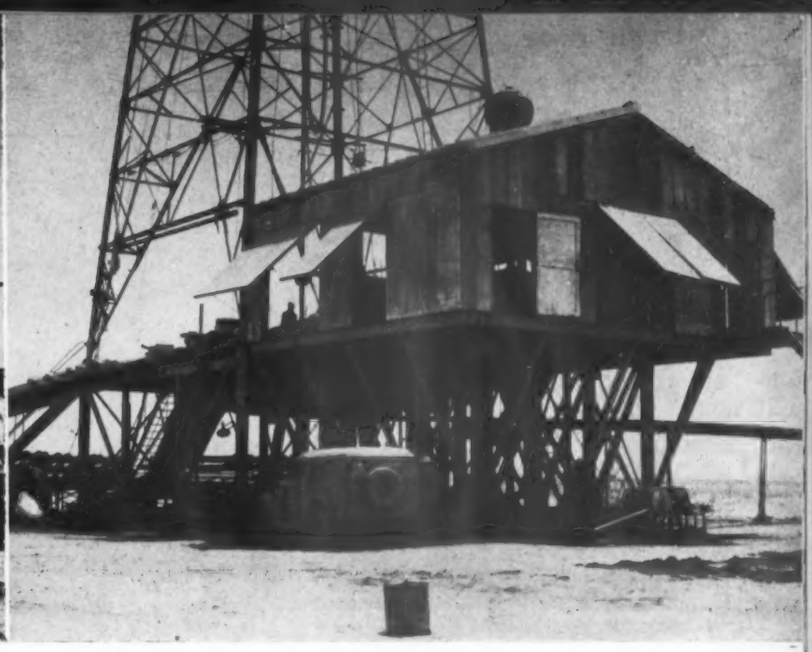
In the next three years the exporting countries of Latin America may be able to increase their output by 400,000 barrels daily, but by that time the import requirements of the United States probably will have risen by at least that amount, and consumption in other importing nations of the western hemisphere will have grown substantially. Production in the Far East very likely will have advanced to 300,000 barrels daily, and it may be able to supply a minor part of the



Motor vehicles equipped with 40 wheels hauling a 50-ton gas trap from Dhahran to Abqaiq for Aramco use. Corsini photo.



Water distillation unit at Fahaheel, Kuwait. A new unit capable of distilling 600,000 gallons of water now is under construction to supplement the supply brought by boat from Abadan and the local supply of brackish water.



New type substructure used on Burgan No. 11. Drawworks and engines are on one level, above shifting desert sands. The design was adopted by Gulf and Anglo Iranian engineers to permit skidding the rig in two self-contained units.

eastern markets now dependent upon the Persian Gulf region. Russia is left out of account, as there is little prospect of its becoming an export nation within that period. Of the five great oil-producing areas of the world the only one that can be counted upon to provide the additional million barrels or more daily that will be required is the Middle East. Of its ability to supply this increased quantity so far as production is concerned, there can be no question. If the means can be found to construct the pipelines that are projected for completion within that time, it can deliver an additional million barrels daily on the eastern shore of the Mediterranean.

The strategic position of Middle East oil is illustrated by the part it was designated to perform in the execution of the European Recovery Program. Recognizing that the rapid economic rehabilitation of the sixteen countries embraced within the plan depended upon the mechanization of agriculture, the motorization of transportation and the replacement of coal by oil for a variety of uses, the framers of the plan placed petroleum near the very stop of its list of requirements. Their schedule called for imports increasing 480,000 barrels daily between 1947 and 1951. The resultant figure of a million and a quarter barrels did not represent the full requirements of the countries concerned but was evolved as representing the maximum amount that could be provided. To carry out the project with the greatest benefit to participating countries, it was planned to enlarge European refining capacity by roundly a million barrels daily and to draw the bulk of the crude for their operation rfom the Middle East, as the only source from which it could be readily obtained. Inability to provide the needed refining facilities or to complete the pipelines projected for the movement of Mid-East oil to the Mediterranean will seriously curtail the recovery plan or else will throw a burden on the petroleum resources of the United States which can be met only by restricting the supply available for domestic use and imposing serious hardship upon American consumers.

From the viewpoint of the world situation it appears to be the destined function of the Middle East to fill the gap between the swift rise in worldwide demand and the normal expansion of production in older and more fully developed fields. In this respect the maintenance of conditions that will enable it to accomplish this task is of primary importance not only to the international oil industry but also to all governments that are interested in industrial progress and the improvement of living conditions of the world's population.

Sea end of tanker loading line ready to be pulled into the Persian Gulf for loading Kuwait crude into tankers. There now are five loading berths each of which has two 12¾-inch O.D. loading lines to the shore. Shallow sandy beaches prevent seagoing tankers approaching close to the shore for loading. Photographs with this article courtesy Kuwait Oil Co.

ARGENTINA COMPLETING ITS FIRST LONG GAS LINE

By Ruth Sheldon

Map showing route of new gas line.

THE 1,100-mile gas pipeline which the Argentine Government Gas Department is rapidly laying from Comodoro Rivadavia to Buenos Aires will be completed in early 1949. It is not only the longest pipeline in South America but the most ambitious social project which any South American government has undertaken in the utilization of its natural resources.

The social aspect of this pipeline is the prime motivating factor in its construction, and it ranks high in General Juan B. Peron's five-year plan. Benefits from the distribution and use of gas can be felt more dramatically and directly by the individual consumer than those from any other natural resource, with the exception of water. Also in a country as desperately short of fuel energy as is Argentina, the non-utilization of a great known gas reserve constitutes waste of the highest order.

The gas reserves available for use from Comodoro Rivadavia, Argentina's oldest and most prolific oil area, are estimated to be a minimum of 12 billion cubic meters. This is considered sufficient to supply the projected domestic and industrial needs of the communities along the route of the pipe line and the greater Buenos Aires area for a minimum of twenty years. It will open up a new way of life to thousands of people who heretofore could not afford to use high-cost manufactured gas and who have been dependent upon more primitive fuel sources. Furthermore, by having gas available for industrial purposes for a thousand-mile stretch on the Argentine seacoast, a decentralization of industry from the already overcrowded Buenos Aires area is expected with the resultant strengthening of the country's economy.

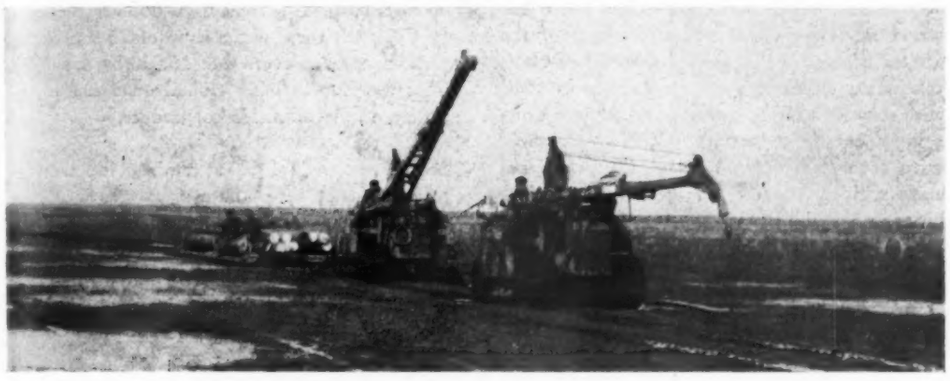
Over the twenty-year period it is estimated that the use of the gas reserve will obviate the necessity of importing a total of some 245,000,000 barrels of oil, as the utilization of gas will replace that amount of imports for the same purposes. This is of prime importance to Argentina, which today can produce only 45 percent of its domestic oil needs and has difficulty in meeting the balance of its requirements from foreign sources.

Argentina is making every effort to reduce its dependence on imports of fuel energy, and as Ing. Pedro F. Rodriguez, assistant technical director of the pipeline project, states, "Aside from any other technical or economic consideration, the construction of the gas pipeline would be justified alone for its contribution to the country in this sense, apart from its other advantages."

Although the utilization of the natural gas reserves in Argentina has been the subject of study for many years, the project of the gas pipeline was definitely planned a few years ago when Ing. Julio V. Canessa, today general director of the department known as Direccion General del Gas del Estado, was placed in charge of the project. In 1942 the third Congress of Argentine Engineers resolved, after studying the report entitled, "Natural Gas in Argentina and the Future Utilization of its Reserves," presented by Ing. Canessa, Ing. Toefilo M. Tabanera and Ing. Carlos A. Delorme, "to undertake the utilization of the natural gas reserve and to provide adequate means of transporting it through all the towns that would make it feasible from an economical and technical point of view." In February, 1947, the project was authorized by federal decree, and actual construction work was begun in the Buenos Aires area that same month.

In order to speed the project, construction is proceeding simultaneously from Buenos Aires going south and Comodoro Rivadavia going north. The northern part of the 10 and 10¾-inch welded pipeline is being constructed by the Argentine Government Gas Department itself, using pipe fabricated in Buenos Aires, which will total 50 percent of the line. The southern part is being constructed by a contractor firm using Italian pipe. Combined construction is moving at the average rate of over 2½ miles daily. Since the private contractor began work in February, 1948, some 68 miles were laid as of June 15 this year on the south section, and 248.7

Sleds were fabricated from sections of pipe for use in stringing pipe on muddy prairies.



↑Crawler tractors drawing sled loaded with line pipe.

↑The line was protected against corrosion.

Equipment for repair and maintenance of trucks and tractors was mounted on jeeps to accompany the crew.

miles have been completed as of the same date on the north section where work began on the main line in August, 1947.

This is a one hundred percent Argentine project with no foreign technicians or assistance in any respect. The Argentine workers have been provided with all modern equipment and are doing a highly creditable job in a field new to them. They are literally laying the pipeline on wheels, for as the line progresses, fleets of trailers, trucks and jeeps move with it providing housing, offices, warehouses, radio stations, hospital, power plants and fuel. Supplemented by ambulances and buses, the pipeline motorcade is unique.

An even more modern touch is being provided by the Department's recent purchase of a helicopter, which will be used for patrolling the line and for reconnaissance.

The pipeline route follows as closely as possible the main highway from Comodoro Rivadavia to Buenos Aires, which not only helps speed operations but serves the additional and important purpose of laying the line through existing centers of population.

The initial capacity of the line will be 12 million cubic feet daily, which will be increased to 42 million cubic feet as consumption requires. The line will service 14 towns between Comodoro Rivadavia and Buenos Aires which have a total population of 220,000. It is estimated that by 1951, the first year of full use, 10 percent of this population will be clients. Work has begun on distribution systems, financed by the government, and the government will finance their purchase of all necessary appliances, such as stoves, heaters and refrigerators.

The principal consumers, of course, are in Buenos Aires, the adjacent city of La Plata, and nine other communities in this general area. Buenos Aires alone has today 237,440 users of manufactured gas, and it is estimated that by 1951 this will be increased to 350,000 users. A great increase in sales of gas stoves and other appliances is anticipated, as their use has heretofore been restricted by the high cost of manufactured gas.

The Argentine Government Gas Department estimates that natural gas rates will be 50 percent lower than present manufactured gas charges, representing a saving to the consumers of 25,000,000 pesos during 1949 and of two billion pesos for all users now and in the future on the basis of using the total known gas reserves.

The present big gas plant in La Plata, which the government took over in 1947, will be used, as well as smaller existing plants, as stand-by plants and to meet peak requirements during the winter season.

Although the pipeline will be ready for use in early 1949, the Government Gas Department plans at first to use a mixture of manufactured and natural gas to provide sufficient time for changing over equipment for the use of natural gas alone.

World Crude Production Tops Nine Million Barrels Daily

WORLD production of crude oil was more than a million barrels per day greater in the first half of 1948 than in the same period last year. Output exceeded the average for all of 1947 by 724,000 barrels to reach 9,031,900 barrels per day.

With this all-out record of achievement the international oil industry succeeded in getting the jump on demand in the United States and did much to meet the hunger for oil for reconstruction in war-torn Europe. No gasoline shortages have developed in the heavy motoring season in the United States, and the new record consumption of motor fuel has been attained without sacrificing next winter's supply of fuel oil.

In the western hemisphere the increase in crude production was entirely the result of the drilling of more wells, whereas in the Middle East the greater output was made possible by improved transportation facilities. In the East Indies the increase was due both to drilling of new wells and reconditioning of wells which had been damaged during the war.

Well completions in the United States were up 20 percent in the first half of 1948 compared with the same period a year ago, jumping from an average of 2,500 to an average of 3,000 wells per month. The percentage increase in domestic U. S. production was not commensurate with the drilling rate. Crude output rose 10 percent and drilling 20 percent. One reason for this, of course, is that much of the drilling was in wildcat territory where the success ratio is low.

Venezuela, the second largest oil-producing country in the world, increased its output 13 percent in the first half of the year to 1,310,000 barrels daily. In the first half of last year the production in Venezuela averaged 1,170,000 barrels daily. The increase in Venezuelan production was almost exactly at the same rate as for the world as a whole and well above that of the United States. Drilling activity in Venezuela is continuing at about the same rate as in 1947 with some 135 rigs active and completions averaging about 65 per month. On June 30 there were roundly 6,000 producing wells in Venezuela with an average daily production of 220 barrels per day. This compares with an average per well in the United States of eight barrels.

There seems no reason to suppose that crude output of Venezuela cannot be maintained at its present level or increased as may be necessary. Cretaceous discoveries in western Venezuela are adding very largely both to current production and to reserves. Geological opinion is that there is a very large area in which prolific Cretaceous wells will be completed, although at much greater depths in parts of the favorable areas. At present nearly 20 percent of the crude output of western Venezuela is from Cretaceous fields.

Production of all Latin American countries in the Caribbean and South America increased 134,800 barrels daily average in the first half of 1948 compared with the same period last year. This rise of 9.7 percent compares with 9.9 percent in North America. A substantial increase was achieved in Argentina where the YPF reported a gain of 13 percent. Increase for all operators was 9.5 percent to 64,000 barrels daily. In Colombia there was a drop of 23 percent in production to an average of 50,000 barrels daily. This was due to labor troubles and not to inability of the oil fields to produce.

In the eastern hemisphere crude production increased almost three times as fast as it did in the western hemisphere in the first half of the year. The increase was 430,700 barrels daily average over the first half of 1947, a rise of 28.8 percent. Daily average for the period was 1,924,500 barrels.

Crude production in the Near and Middle East was permitted to rise 30 percent in the first half. The word "permitted" is used in this connection because the increase, with the exception of Kuwait and Egypt, was due to greater avail-

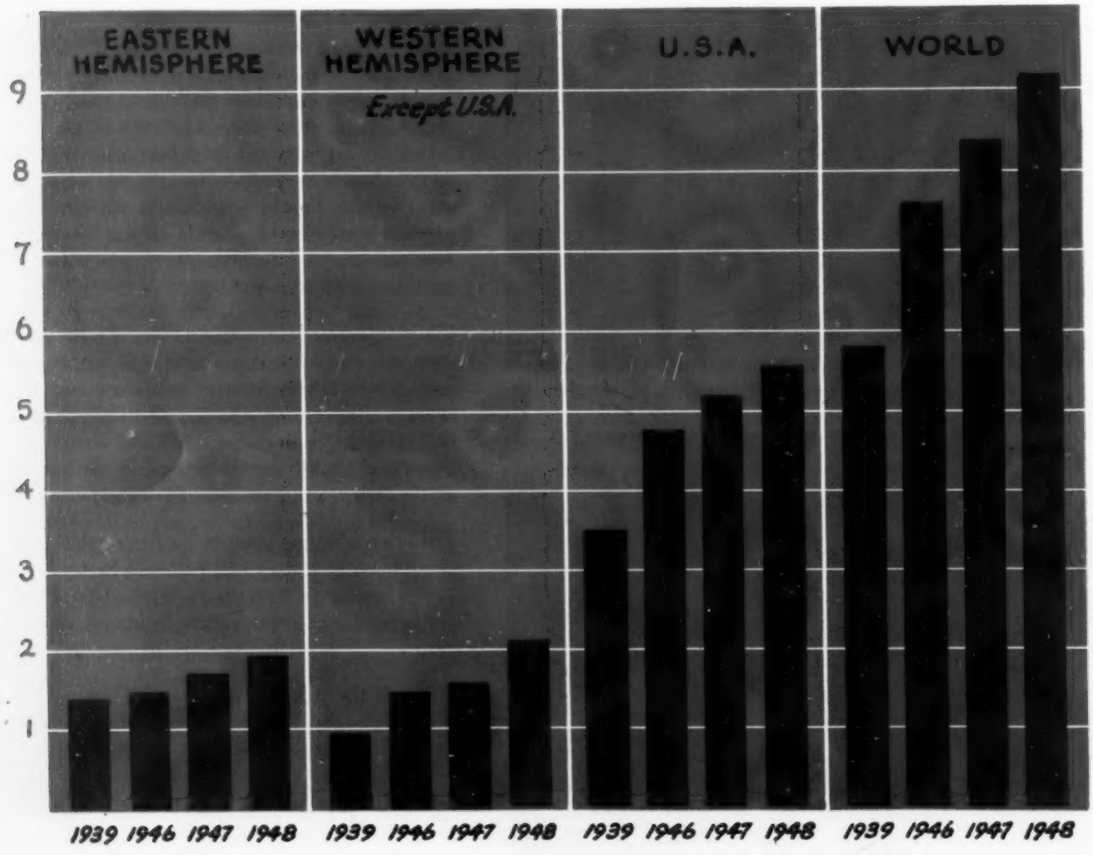


Chart showing growth of crude production in major geographical areas since the war and comparison with prewar production.

ability of tankers to deliver the oil and to refining capacity to handle it in Europe. Average

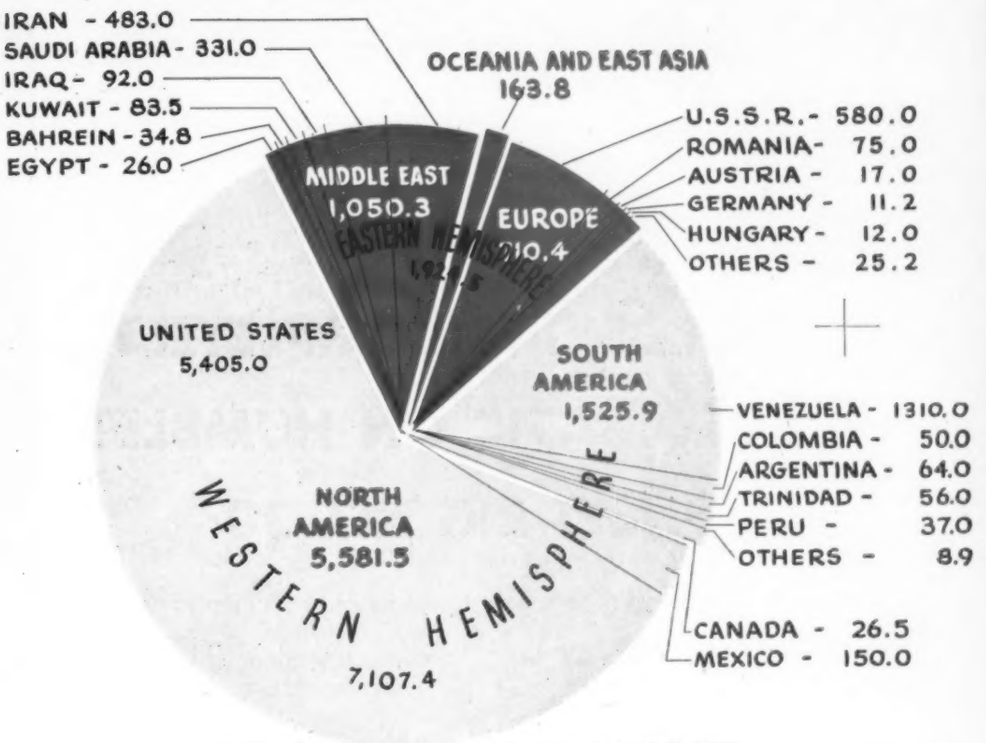
World Crude Oil Production

(Thousands of Barrels Daily)

Area	1948 1st 6 Mo.	1947 1st 6 Mo.	1947 Year	1946 Year
United States	5,405.0	4,916.0	5,085.2	4,749.1
Canada	26.5	19.6	21.2	20.6
Mexico	150.0	145.0	153.7	134.6
No. America	5,581.5	5,080.6	5,260.1	4,904.3
Venezuela	1,310.0	1,170.0	1,208.0	1,064.0
Colombia	50.0	65.0	71.0	61.5
Argentina	64.0	58.0	60.0	56.9
Trinidad	56.0	55.0	56.1	55.0
Peru	37.0	35.0	37.6	34.2
Ecuador	6.9	6.3	6.3	6.5
Bolivia	1.2	1.0	1.0	1.2
Cuba	0.4	0.6	0.6	0.6
Brazil	0.4	0.2	0.2	0.2
So. America and Caribbean	1,525.9	1,391.1	1,439.8	1,280.1
Western Hemisphere	7,107.4	6,471.7	6,699.9	6,184.4
Iran	483.0	410.0	424.0	401.1
Saudi Arabia	331.0	220.0	246.0	165.2
Iraq	92.0	96.0	98.0	96.7
Kuwait	83.5	40.0	44.6	16.2
Bahrein	34.8	24.7	26.0	21.9
Egypt	26.0	24.0	25.6	24.5
Near and Middle East	1,050.3	814.7	864.2	725.6
Netherlands East Indies	80.0	10.0	22.0	5.7
British Borneo	50.0	18.0	35.6	5.7
Sakhalin	20.0	20.0	20.0	20.0
India, Pakistan and Burma	6.8	8.0	8.0	8.0
Japan	4.0	4.0	4.0	3.0
China	3.0	3.0	3.0	2.0
Far East	163.8	63.0	92.6	44.4
Romania	75.0	81.0	79.2	86.2
Austria	17.0	15.0	16.9	15.1
Germany	11.2	11.0	11.0	12.4
Hungary	12.0	12.3	12.0	14.1
Poland	2.7	2.5	2.5	2.6
Netherlands	7.0	4.0	4.0	1.2
Albania	1.5	1.5	1.5	1.0
France	1.1	1.0	1.0	1.1
United Kingsdom	1.0	1.0	1.0	1.1
Czechoslovakia	0.7	0.6	0.6	0.5
Yugoslavia	1.0	1.0	1.0	0.1
Italy	0.2	0.2	0.2	0.1
Europe ex USSR	130.4	131.1	130.9	135.5
U.S.S.R.	580.0	485.0	520.0	451.0
Eastern Hemisphere	1,924.5	1,493.8	1,607.7	1,356.5
World	9,031.9	7,965.5	8,307.6	7,540.9

Percent of World Production —Principal Nations

Area	1948 1st 6 Mo.	1947 1st 6 Mo.	1947 Year	1946 Year
United States	60.0	62.0	62.0	63.0
Venezuela	14.5	14.6	14.2	14.2
U.S.S.R.	6.6	6.4	6.2	5.8
Iran	5.4	5.2	5.1	5.3
Saudi Arabia	3.7	2.8	3.0	2.2
North America	62.0	64.0	64.0	65.0
South America	17.0	17.0	17.0	17.0
Western Hemisphere	79.0	81.0	81.0	82.0
Middle East	11.1	10.2	10.3	9.7
Oceania and Far East	1.8	0.8	1.0	0.6
Europe incl. U.S.S.R.	8.1	8.0	7.7	7.7
Eastern Hemisphere	21.0	19.0	19.0	18.0



World crude production by nations and areas in the first half of 1948.

production for the Near and Middle East was 1,050,300 barrels daily.

In Kuwait seven rigs are running currently, and more are on the ground but are not being operated because of a shortage of manpower. As a combined result of the added drilling and of more tanker room, Kuwait production was more than twice as great as a year ago. Average for the first six months was 83,500 barrels daily, and in June the average was up to 110,000 barrels daily compared with 2,000 in December.

Daily average production in Saudi Arabia was 331,000 barrels in the first half, up 111,000 barrels daily from 1947. In June production was averaging 410,000 barrels daily. Ten wells were drilled in Saudi Arabia during the half year, bringing the total on production June 30 to 61. Average production per well is now about 6,750 barrels per day. A wildcat uncovered one important new field in Saudi Arabia in the first half. This new Ain Dar field is about 27 miles west of Abqaiq and is one of a number of known highs in a folded area roughly parallel to the present producing fields. Producing horizon is the same as present fields, and the oil is similar. The discovery has about 250 feet of oil-bearing sand topped by about 6,660 feet. The discovery is not only important in itself but also as an indication that other highs on the new trend may be great producing fields. On nearby Bahrein island production was increased 10,000 barrels daily to 34,800 barrels per day. At the end of 1947 64 wells produced 28,000 barrels daily.

Due to interruption of the pipeline flow of oil from Iraq to Palestine, the production of that area was lower in the first of 1948. When political conditions become settled once more, production will be enlarged to pipeline capacity.

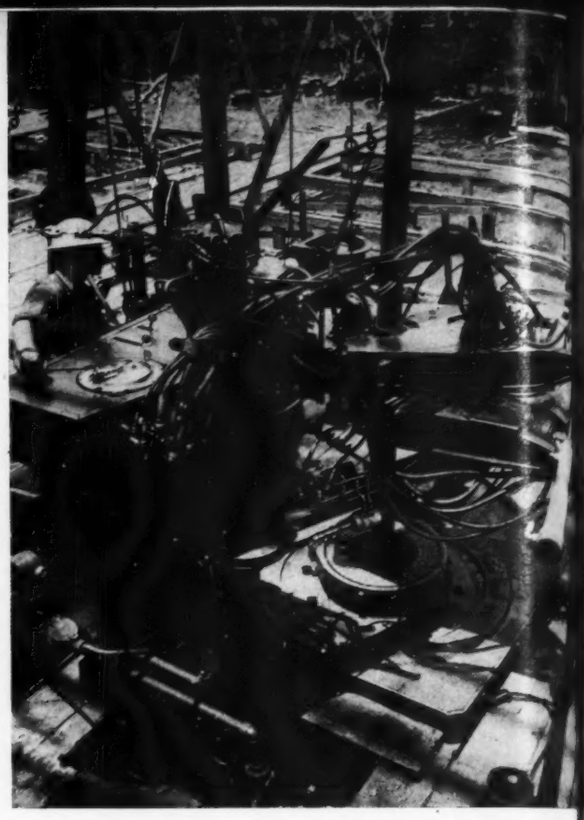
In Iran production was raised to 483,000 barrels daily in the first half, an increase of 73,000 barrels or 18 percent over the first half of last year. This was made possible by the restoration of the British tanker fleet to prewar capacity.

Rehabilitation of the Netherlands East Indies continued apace during the first half year. There are still considerable areas in which the oil companies are not yet operating, due to the political unrest which still continues, and current output of the N.E.I. is a little less than half that obtained in 1939. The production of British Borneo continues to grow and reached 50,000 barrels per day average in the first half year compared with 18,000 barrels daily a year ago.

The situation with respect to the future of concessions in Burma still is not clear, and rehabilitation of production is not proceeding very rapidly. Current production is only a fraction of prewar.

Production in Europe continues at about last year's levels. The loss sustained by Romania is being made up by increased output of fields in the Netherlands and Austria.

Russian government announcements suggest that the current plan is being exceeded and that crude oil output is nearly up to the prewar level. Best estimates available are that Russian production including Sakhalin and the Polish area now included within the formal borders of the country is averaging about 600,000 barrels daily compared with 505,000 barrels daily in the first half of 1947 and 540,000 barrels for all of last year. With drilling activity still on the upgrade throughout the world and more transportation becoming available, it is clear that the oil industry is meeting the challenge of postwar demand.



Remote Control power tongs break out drill pipe connections with the pull of the large hydraulic cylinder at right.

DRILLING IS COMPLETELY AUTOMATIC ON HUMBLE'S NEW RIG NO. 30

AUTOMATIC rotary drilling has been extended into new areas in a new rig recently perfected by Humble Oil & Refining Co. after several years of research and field trial. About the only physical labor remaining in the drilling operation on Humble's automatic "Rig No. 30" is performed by the rotary helper who washes down the drill pipe and unlatches the elevators. Even this last job is going to be made automatic when new elevators, now under construction, are delivered.

On Rig 30 remote control power tongs make and break drill pipe during trips. Pipe is automatically racked so that the derrickman may remain seated on the monkey board while pipe is being stacked and run. Drill pipe is automatically fed off with the Humble "walking brake" to maintain a constant weight on the bit. Constant rotary speed is maintained with a new type governor. Air throttles have been added to Rig 30 although it is steam powered and, of course, air slips are employed. A new air application is for greasing the rig, a time saver.

Work began on the remote-control power tongs and pipe-racker in September, 1945. Field operating tests on Rig No. 30 began on April 28, 1948, and are nearing completion. As finally developed, the remote-control power tongs and pipe-racker are a joint development of Humble and Byron Jackson Co. of Los Angeles.

Most of the physical effort of making round trips and drill pipe connections has been eliminated by the remote-control power tongs and pipe-racker. The derrickman and tong operator control this equipment from comfortable seated positions; the driller has been relieved of operating the cathead and operates only the slips, hoisting engine and brakes with air controls; the other rotary helper on the floor merely latches and unlatches the elevators. Although the speed of pulling one stand with the new equipment is only a little greater than is possible with conventional hand operation, this speed can be maintained indefinitely regardless of hole depth, whereas fatigue slows crews working conventionally during long trips. Tongs in use today weigh approximately 380 pounds, and slips weigh about 180 pounds. Safety is substantially improved, as the derrickman need not move from his seat on the monkey board up in the derrick, and the tong lines and spinning chain are eliminated from the derrick floor.

The remote control pipe-racker consists of two electrically-operated "arms," one at the monkey board and one on the first girth on the ladder side of the derrick. The arms grip the pipe and move it to the desired spot on an elevated pipe platform when coming out of the hole, and pick it up from the platform and carry it to the power tongs when going in the hole. The upper arm

Remote Control Power Tongs under the control of man at left, are handling a stand of 5-inch drill pipe to the lower racking arm (upper center) which will rack it on the elevated pipe platform at right.

is operated by the derrickman on the monkey board and the lower arm by the tong operator on the floor. Each arm is controlled by a single control handle similar to an aircraft "joy stick" which is tilted in the direction of desired motion. Simultaneous motion in two directions is possible, permitting quick movement to any spot within the operating area. A trigger mounted on the control handle releases the grip on the pipe as desired.

The racker arms are actually 3-inch lead screws, similar to those used on lathes and other feeding machines, which are moved by belt-driven nuts. The 12-foot racker arms, powered by 3-hp. 220-volt AC 3-phase electric motors, reach 10 feet out across the derrick. Keyways in the arm permit it to move without rotation as the nut drives it. A stationary lead screw mounted on the derrick gives lateral motion along the side of the derrick when a second nut rotates about it. A 2-hp. 220-volt AC 3-phase electric motor drives this nut. The lead screws give one inch travel per half revolution of the nut, and move the arms at approximately 2-feet per second. Limit switches prevent fouling the nuts. The propulsion units are identical, except that the monkey board moves along the side of the derrick with the upper racking unit. Each racking unit travels on a track consisting of four-inch pipe reinforced with welded guide strips, allowing 8-feet travel for the monkey board and 10-feet for the lower racking arm. Control circuits are 110 volts AC.

On the end of the upper arm is a claw which grips the pipe on contact and is released by the control handle trigger. The "finger" of the claw is operated hydraulically by a solenoid valve. No weight is supported by the upper arm, and a safety shear pin permits the "hand" to rotate downward and release the grip should the arm become overweighted. The lower arm grip or "hand" incorporates an auxiliary elevator for lifting the stand out of the tongs and off the pipe platform. A parallelogram linkage on the end of the arm permits a maximum travel of 10 inches vertically, as the arm remains in the same plane. This elevator is actuated by a push-button-controlled hydraulic cylinder mounted just under the monkey board and connected to the lower arm by a ⅜-inch wire line. The elevator is designed to support, a 90-foot stand of 5-inch EUIF drill pipe weighing approximately 2,000 pounds.

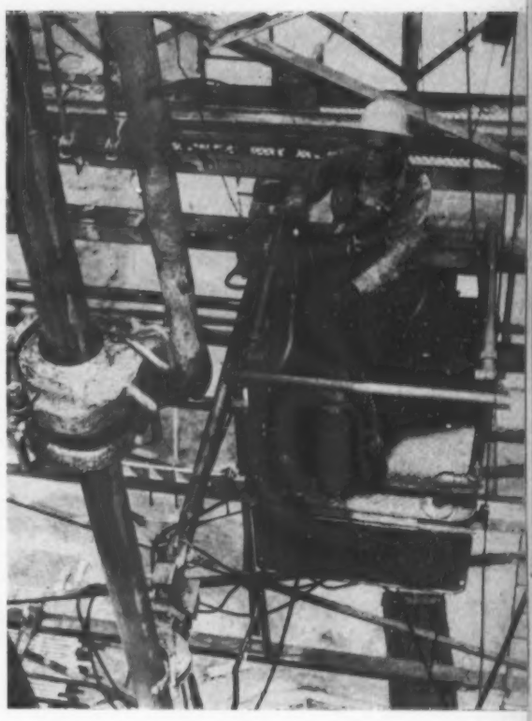
Drill pipe is racked on the special steel platform on the ladder side of the rotary. The platform is 5.2 feet above the floor and 4.6 feet above the rotary. Currently the pipe is racked in a hay-rake and fingers, normally racking four rows of 13 stands, two rows of 10, two rows of 8, and one row of 6 stands; 16,000 feet of pipe can be handled.

The monkey board is mounted on the upper racking unit, and travels laterally across the ladder side of the derrick. The board is equipped with a seat and handrails, the control handle and safety cutoff switch being located on the right handrail. The upper racking arm moves side-to-side with the monkey board, and the 10-foot travel of the arm provides ample room to insure automatic latching of the Byron Jackson type "B" elevators. When manual racking is necessary, a 1-foot extension on the monkey board is raised in place, and the front handrail drops down to reinforce the extension.

Manual handling of tongs has been eliminated by the remote-control power tongs, which handle pipe from 2⅞-inch drill pipe to 8-inch drill collars without adjustment. The hydraulic-powered tongs will make up, break out, spin up and spin out pipe in that range with equal ease. The tong operator faces the driller as he controls these operations with eight hydraulic valves mounted in the tong control box.

The power tongs, operators seat, and control box are mounted on a 6-inch column mounted four feet from the center of the rotary on the drawworks side. The supporting column is bolted to the substructure and guyed to the derrick at the top. A hydraulic lift built into the column provides a three-foot vertical travel of the entire unit, permitting operation at any height in that range and allowing the driller a tolerance in setting the slips.

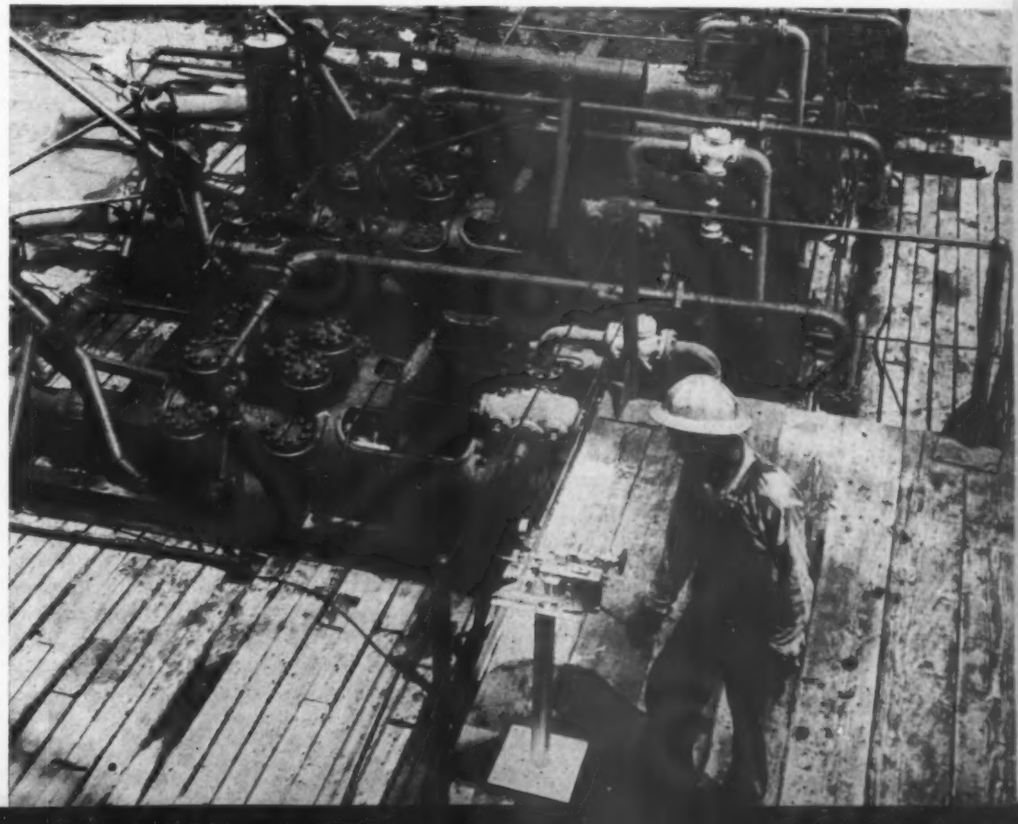
The tongs are in two frames, with the upper frame mounted to rotate 30 degrees about the drill pipe center for maximum tonging. The two tong frames rotate together 180 degrees about the supporting column on a 4-inch pipe arm. All operation is hydraulic, utilizing eight hydraulic cylinders and one hydraulic motor to latch and unlatch the tongs, grip and spin the pipe, and carry it. The hydraulic motor develops 8800 pound-inches of torque and spins the knurled rollers at 80 rpm. for spinning the pipe in either direction. A force of 15,000 pounds is used against the rollers for spinning.

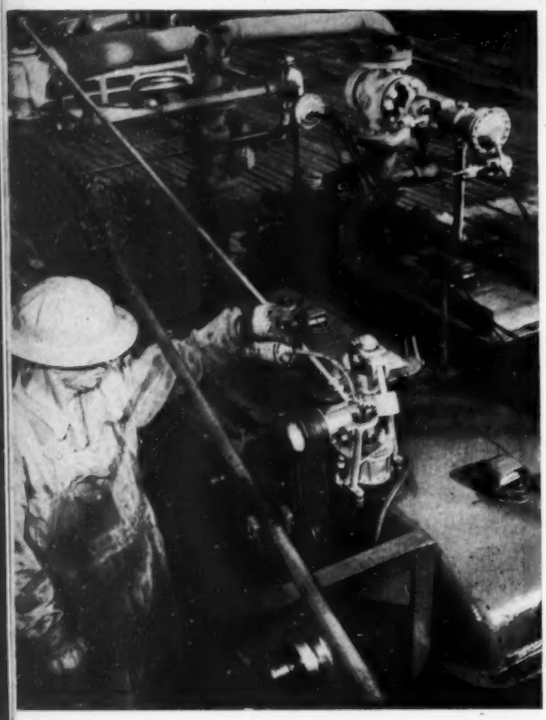


The upper racking arm gripping the drill pipe is controlled by the handle in the derrickman's right hand. Derrickman need not move from his seat, as the elevators latch automatically.

Maximum breakout torque is 1,600,000 pound-inches and maximum make-up torque is 800,000 pound-inches. Normal operating pressure is 1500 psi., although 2500 psi. is used for maximum torque. Hydraulic pressure is supplied by a 35-hp. pump which is interchangeable with the spinning motor on the tongs. The pump is powered by a four-cylinder engine mounted on a skid located under the engine platform which also contains the filters and 150 gallon hydraulic oil

Drilling crewman operates the pneumatic pump throttles which control the two large mud pumps in the background.





Driller oils the rotary speed governor mounted on the engine of Rig No. 30.

supply tank. The hydraulic fluid is turbine oil, and is filtered on return from the operating system.

The derrickman, on the powered monkey board, controls the upper racking arm from a seated position. All movement of the drill pipe up in the derrick is by the racking arm, the derrickman's only manual operation being to unlatch the elevators when coming out of the hole. Even this hand operation will be eliminated when automatic elevators, now under construction, are completed.

All tonging operations and pipe handling on the derrick floor are remotely operated by the tong operator from a seated position. He controls each individual operation with his eight control valves, and his racker control handle. The driller operates the drilling engine, air brakes, and air slips by air control valves. The rotary helper on the floor only latches and unlatches the elevators and washes the drill pipe.

As soon as the driller sets the air slips after pulling a stand of drill pipe, the tong operator moves the tongs to the pipe at the proper height, and latches the tongs. The tong operator sets the grip, and the upper frame rotates 30 degrees to break out the connection. The grip is released, the upper jaw takes the carrying grip, and the lower jaw is unlatched. The tongs lift the stands as the driller spins the joint out with the rotary. (The spinning may be done with the tong rollers, although rotary spinning is faster and relieves the tong operator of one more operation.) While the breaking-out operation is underway, the derrickman pulls the stand to him by means of his powered hook and manually unlatches the elevators. As soon as the threads clear the tool joint, the stand is carried to the transfer position through a 51-degree arc by the upper frame. (Both frames move together. This transfer position, approximately four feet from the rotary, is necessary to allow clearance for the traveling block.) At the transfer position the lower racking arm, under the control of the tong operator, grips the pipe automatically on contact, lifts the stand from the tong frame, and racks the stand in its proper place. The stand is carried with about two inches clearance above the pipe platform, and the drop to the platform is easy as the grip-release trigger is pulled. A push-button automatically returns the racker to the transfer position. The derrickman racks the upper end of the stand simultaneously with the lower end. The driller lowers the block as soon as the derrickman unlatches the elevators, and the rotary helper latches the elevators on the pipe in the rotary.

Going in the hole both racking arms pick up a stand and move it to the transfer position. (The auxiliary elevator on the lower racker arm supports the weight of the stand from the hydraulic cylinder mounted on the derrick.) The derrickman centers the monkey board and holds the pipe clear of the block. At the transfer position the auxiliary elevator lowers the stand into the upper tong frame, which grips the tool joint. The operator then swings the tongs around and stabs the stand into the joint in the slips. The lower jaw is latched and the stand is screwed up by the spinning motor, after which both jaws grip the pipe. The upper frame then rotates 30 degrees to provide final tightening. (This is sometimes repeated as required to produce a tight connection.) While the tonging is in progress, the derrickman moves the upper end of the stand into the automatically-latching elevators. Tonging complete, the driller picks up to free the air slipe, and lowers the pipe into the hole.

By the time the pipe is lowered into the hole, the slips set by the driller, and the elevators unlatched by the rotary helper, the tong operator and derrickman have moved the next stand into the transfer position, and await the ascending block to clear the stand before repeating the process. By contrast with conventional operation, the block is run up and stopped before the pipe is pushed into the elevators by the upper racking arm.

Drill pipe connections are made with the power tongs using a special vertical mouse-hole directly in front of the driller on the tongs operating arc. When the tongs are not in operation they are swung out of the way in front of the drawworks.

The new type automatic control adaptable to any make feed-off device has recently been installed for use with the Humble-devloped "walking brake." This equipment, under development for several years, permits the driller to set the weight he desires to carry on the bit on a dial and the control unit automatically operates the feed-off of the brakes to maintain that weight uniform.

The walking brake permits feed-off of the drilling line at a controlled rate. It consists of two independent air brakes, one on each drum of the drawworks, which are engaged alternately. Hydraulic cylinders are connected to each brake, which permit the brakes to rotate a short distance with the drum. The speed of rotation of the drum is controlled by varying the restriction of the hydraulic fluid flow from the engaged brake side to the opposite hydraulic cylinder. The brakes "walk" because only one is engaged at a time. During a trip, the driller's air control handle operates both brakes together as in conventional braking.

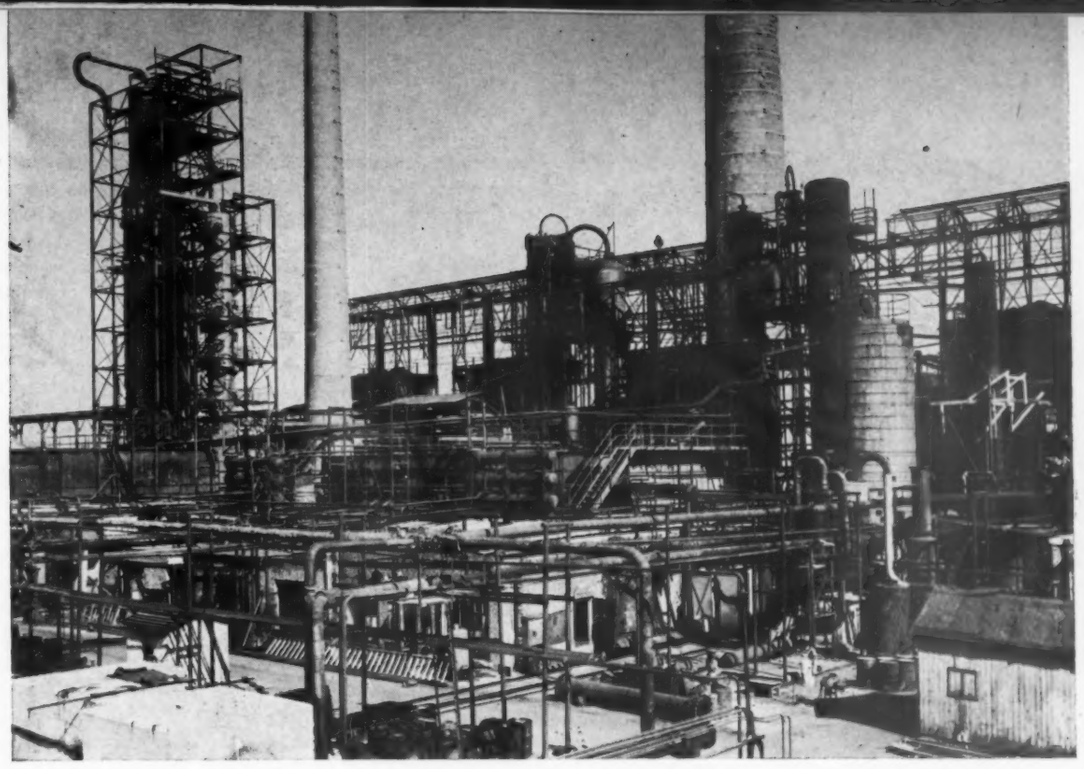
Automatic drilling control insures that the bit is always digging at the fastest rate by maintaining the proper weight on the bit. The possibilities of twisting off the drill pipe due to excess weight are greatly reduced, holes are straighter, and the bit digs faster and longer with uniform bit weight. Hand operation usually results in either too much weight or too little weight most of the time, both reducing the rate of penetration. Hand feed-off is at best irregular, depending entirely on the skill and patience of the individual. The importance of maintaining an automatic feed and uniform weight on the bit increases with depth because (1) the formations are usually harder, (2) the drill pipe driving the bit is under greater stresses, and (3) round trips are more time-consuming. Heavier equipment for deep-drilling is less sensitive to the feel of the operator, which makes automatic control even more important with greater depths.

On Rig. No. 30, the new type of governor attached to the engine throttle maintains the rotary speed constant within close tolerances, to provide the proper weight and speed of rotation ratio. Use of this governor, in addition to contributing to drilling efficiency, prevents possible damage to the drill pipe or the rig due to overspeeding.

On Rig 30 air throttles have been installed on the drawworks engine and the mud pumps. These have improved operation, and permitted closer control of each. One or both pumps may be controlled from the engine platform by the air throttles. A special air-operated bypass valve idles the mud pumps and circulates the drilling mud to the mud pits when drill-pipe connections are made, preventing the pumps from losing their prime when they would normally be shut down.

Air slips are an integral part of the automatic and remote-control equipment. Their use does not save any appreciable amount of time, but reduces drilling crew fatigue by eliminating lifting them each time the drill pipe picked up.

The air greasing unit is another air-operated unit, familiar to service stations but a stranger to drilling rigs. Considerable time is saved in greasing the rig each tour by the handiness of the hose, which will reach any point on the drilling engine or derrick floor.



Ebano Asphalt Werke refinery (Standard Oil Co. of N.J.) at Hamburg-Harburg.

GERMAN REFINERIES AWAIT OIL IMPORTS

By ALFRED M. STAHMER

AT the close of the war German refineries were a chaos of twisted pipes and wrecked tanks and towers. In the series of bombing raids that continued without intermission from the spring of 1944, Allied planes overlooked no plant large or small. The country's biggest refinery, Misburg near Hanover, was subjected to no less than fourteen attacks, and many others were bombed almost as frequently.

In spite of the apparently complete destruction, examination of the ruins after capitulation revealed that many important units were capable of repair. In nearly all cases the storage tanks, relatively conspicuous targets, were rendered useless. On the other hand, boiler stations and stills suffered fewer direct hits. While the bombers accomplished their purpose by putting the refineries out of operation, only two plants in Western Germany, the Shell refinery at Hamburg-Harburg and the Deutsche Erdoel A.G. in Hamburg-Wilhelmsburg, could be described as definitely destroyed in the sense that they could not be restored to partial or temporary operation.

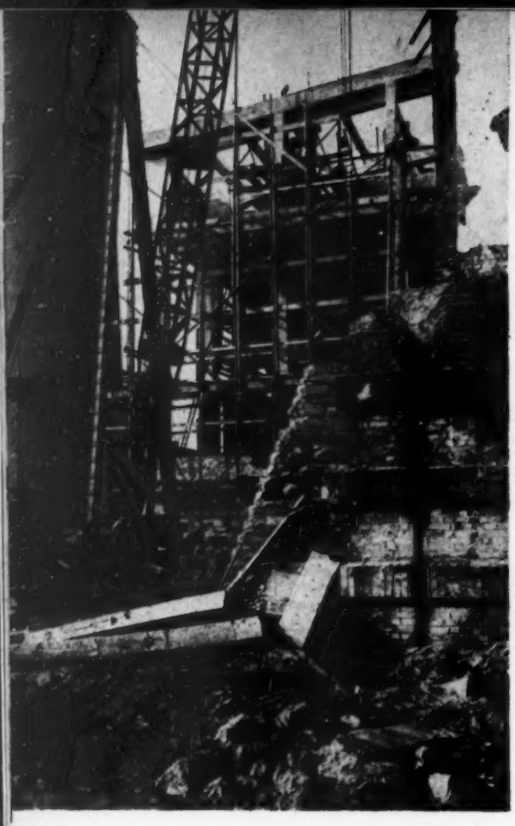
Although fourteen times bombed, Misburg was the first plant to resume operation of its topping and cracking facilities in 1945. Soon thereafter the Vacuum refinery at Bremen-Oslebshausen followed suit. Despite the heavy fighting around Bremen in the final phase of the war, the principal damage to the plant was the loss of its workshops and storage tanks. By the end of 1946 these two plants were able to handle the 50,000 tons of crude which the German fields were producing at that time.

Practically all oil producing and processing activities in Germany are concentrated within the British occupation zone of the northwest. In the Russian zone and in Polish-occupied eastern Germany are only hydrogenation and Fischer-Tropsch synthesis plants, most of which have now been dismantled and transferred to the east, but no oil fields and no refineries except one single crude refinery, Luetzkendorf (Wintershall A.G.) near Leipzig. The American zone contains three small oil fields, two in Baden and one in Bavaria, and one small refinery, that of Zeller & Gmelin at Eislingen-Wuertemberg. This is engaged in building a pipe still, which will enlarge its crude capacity up to 300 barrels daily. The owners of this refinery hope to regain as its crude supply the Badish oil (about 500 tons monthly) which is now treated at the single refinery in the French occupation zone, the Badische Anilin-&-Soda-Fabrik (formerly I.G. Farben-Industrie) at Ludwigshafen-Oppau on the Rhine. The French zone has no other oil facilities, either fields or refineries. Surveys and core drilling are under way in the Bavarian Alps foreland to test prospective oil areas. For this purpose some German oil companies, the Socony-Vacuum and a joint affiliate of Esso Standard and Shell, have obtained oil concessions in south Bavaria and are starting exploration. If oil is found the question of erecting a refinery in the American zone may arise.

In the British zone there are three main centers of refining; Hamburg, the Hanover-Peine district and the Rhine. Single plants are situated in Bremen and near the Heide and Elmsland fields. International oil companies have financial interests in most of these plants, many of them having been engaged in marketing operations in Germany prior to the war.

Since 1890 Esso Standard has been represented in Germany by its affiliate, Deutsch-Amerikanische Petroleum Gesselschaft, which owns the Ebano Asphalt-Werke in Hamburg-Harburg. The Ebano refinery specializes in the manufacture of straight and blown bitumen by asphalt oxidation and emulsification. The distilling facilities of the plant were damaged during the war. Its present crude charging capacity is 3,500 barrels daily. The rebuilding which is under way is directed to raising its capacity to 17,000 barrels daily by the end of 1949. Then Ebano will be the largest German refining plant. Esso Standard also has participation of 16.5 percent in the Misburg refinery near Hanover, a plant of 7,500 barrels crude charging capacity daily, 3,300 barrels cracking capacity and dewaxing installations. Standard has a further participation of 25 percent interest in the Dollbergen refinery of the Deutsche Gasolin A.G. Dollbergen, which specialized in lube oil production prewar, was 50 percent destroyed by bombing, but pipe stills and boiler stations remained nearly undamaged, and it was possible to replace the capacity of 2,000 barrels daily without delay.

The Shell Group owns five German refineries through its subsidiary, Deutsche Shell A.G., and also controls a sixth, the Mineraloelwerke Albrecht & Co. Shell also has an equal interest with Esso Standard in Deurag-Misburg (16.5



Reconstruction work in progress at the Shell plant at Hamburg—Harburg.

percent) and Deutsche Gasolin A.G., Dollbergen (25 percent). The largest Shell plant, that of Hamburg-Harburg, was almost completely destroyed in the last phase of the war. Previously the refinery had a crude capacity of 12,500 barrels daily. At first it was deemed hopeless to attempt rebuilding, but the company now has 1,200 laborers at work clearing away the rubble and preparing for reconstruction. First to be restored is the extraction and dewaxing unit, to be followed by the topping, vacuum and redistillation units. Shell hopes that the plant will be ready in 1950 with a topping capacity of 7,200 barrels daily and corresponding units for vacuum distillation, redistillation, sulfuric acid removal, solvent extraction and dewaxing. An asphalt blow unit will be erected.

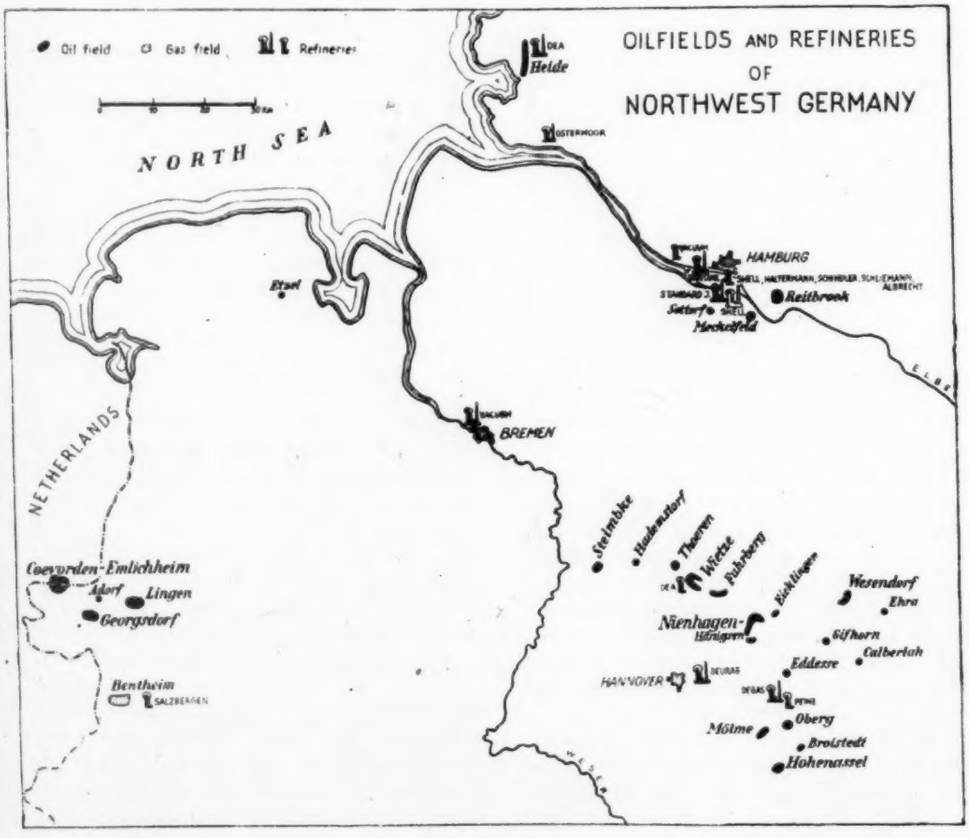
The two oil refineries situated on the Rhine River, Monheim and Reisholz, belong to Shell. Heretofore only indigenous crude has been treated, but in June the first tanker load of Venezuelan crude destined for Monheim arrived at Rotterdam. The cargo of 15,000 tons was shipped by tank barges up the Rhine. Monheim is a skimming type plant, producing special lubes and asphalt with 1,900 barrels crude capacity daily. Reisholz produces BSP benzine and white spirit with 900 barrels half-finished products charging capacity daily. The Shell plant at Hamburg-Grasbrook treats half-finished products for the manufacture of lubes (intake at present about 1,300 barrels daily). The small Hamburg-Wilhelmsburg plant is handling half-finished products for manufacturing benzine and white spirit, 470 barrels daily, and the Mineraloelwerke Albrecht & Co. is manufacturing special lubes and white oils (230 barrels daily capacity of half-finished products).

Shell recently (May, 1948,) concluded an agreement with the Union Rheinische Braunkohlen Kraftstoff Aktiengesellschaft, acquiring a joint interest in the Rhenish lignite mines. At this location was erected early in the war a large coal hydrogenation plant of the type which was expected to make Germany independent of foreign resources. Though seriously damaged in air raids, several of these works are nearly ready for use, but they will not engage in coal liquefaction, both because the process is uneconomical and because Germany has lost its big coal districts. The military authorities have decided, however, that the plants could be used for the manufacture of chemical products such as fertilizers, methanol and waxes.

Foreseeing that in the completed German oil plan the available capacity of the oil refineries, especially the capacity for handling the residues, would eventually not be sufficient, the Allied authorities decided to issue permits for using the plants for crude oil treating. For this purpose two big 700-atm. pressure plants, Wesseling and Gelsenberg, were authorized. The two works have sufficient distilling capacity to hydrogenate 180,000 and 360,000 tons of residues yearly respectively. By treating 80 percent of residues a considerable amount of high-octane gasoline and gas-oil will be gained. The agreement between Shell and Wesseling foresees the right for Shell to use Wesseling for crude oil refining at full capacity for a long term. The first crude will arrive at Wesseling in July, and arrangements are pending for a crude oil supply to Gelsenberg.

The German subsidiary of Socony-Vacuum, the Deutsche Vacuum Oel A.G., is now particularly concerned with the marketing of motor oil. This year marks the 50th anniversary of the company's operations. A second lube oil plant at Bremen-Oslebshausen has an atmospheric pipe still with a capacity of 2,300 barrels daily, and it is planned to erect a new top-distillation unit with an added capacity of 9,500 barrels. After completion of this unit, the plant will be able to treat 500,000 tons yearly. A pier is being built, and the work harbor is being deepened to allow the discharge by sea tankers of 16,000 deadweight. The refining of lubricants is handled by a Duosol extraction unit in a two-stage extraction process which since July, 1946, works at full capacity. The capacity of the dewaxing installation is to be enlarged by a redesign of the scrapers. The old Vacuum refinery at Wedel on the Elbe River treats top distillates from Oslebshausen for the manufacture of lubricants and greases, the capacity being some hundred barrels daily. The company is in a good position so far as crude supplies are concerned, as it can treat oil from its own fields in the Hanover-Hamburg district. It controls the fields Haenigsen, Oberg and Hademstorf and has participation in Nienhagen, Reitbrook near Hamburg, Steimbke and Thoeren, delivering together more than 20,000 tons monthly.

Foreign companies with no marketing organizations in Germany have a share in the German refining industry. The British Crusader Petroleum Industries Ltd. owns the Eurotank refinery in Hamburg-Finkenwerder and has a 51 percent interest in the Mineraloel & Asphalt-Werke. Ostermoor, a refinery on the Kaiser-Wilhelm channel. Recently Eurotank received a permit to repair its plant which had a topping capacity of 3,500 barrels daily and a cracking unit with



a capacity of 2,800 barrels. After reconstruction Eurotank will be able to run 5,800 barrels crude daily. The Mineraloel Asphalt-Werke, Ostermoor, in which Swiss and Danish concerns have an interest, treats crude mainly for producing asphalt. The present capacity of 1,200 barrels daily can be doubled after repair of the units.

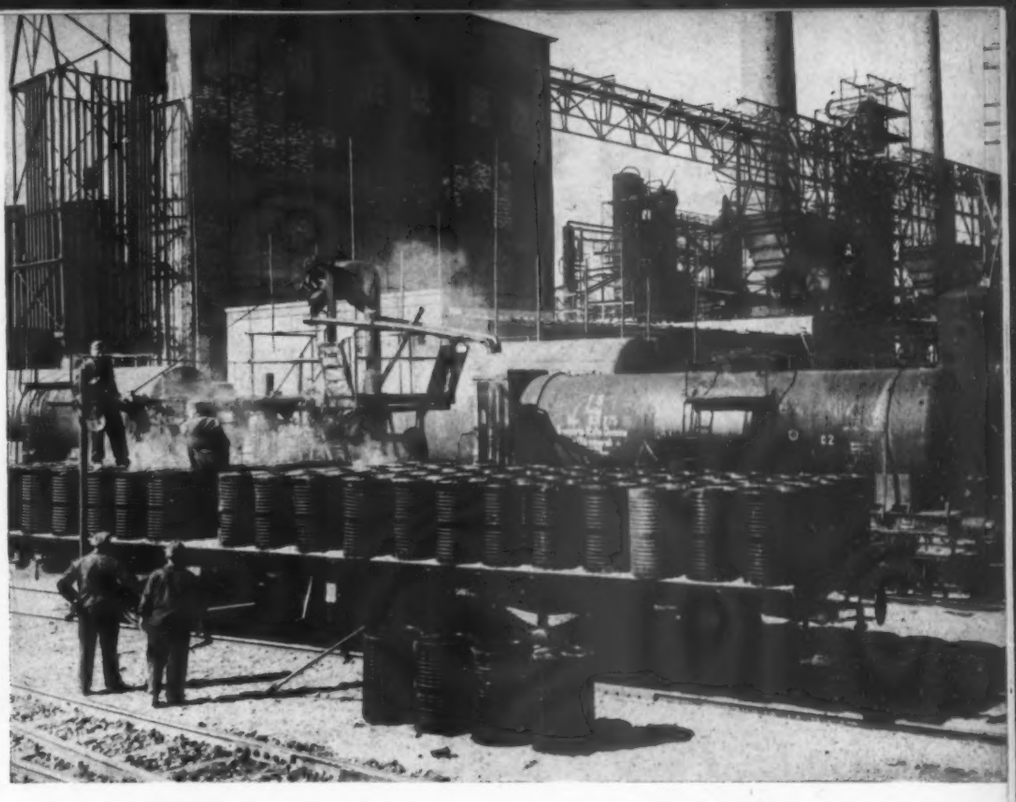
The American Pure Oil Company has an interest in the Mineraloelwerke Julius Schindler. The Schindler refinery in Hamburg is one of the special lubricating manufacturers in the Hamburg harbor district (400 barrels distillate capacity daily). The Mineraloelwerke Peine, near Hanover, belongs to Schindler (350 barrels crude charging capacity.)

The most important German crude producing companies, the Deutsche Erdoel A.G., Gewerkschaft Elwerath, Preussag and Wintershall A.G. have more or less refining capacity. The Deutsche Erdoel A.G. plant in Heide, situated on the Heide oil field, did a lot of repair work since the end of the war. Tank storage is being built. Heide is able to run 2,800 barrels of crude daily, more than the field delivers. In Hamburg-Wilhelmsburg the Deutsche Erdoel A.G. had a 2,300-barrel refinery which was so nearly destroyed that its rebuilding is not yet approved.

A skimming plant with lube and asphalt refining for the Wietze field which is connected with the Wietze oil shaft was not hit during the war, the capacity being 950 barrels daily. The Gewerkschaft Elwerath and the Preussag have a considerable share in the well-known Misburg refinery (Deurag-Nerag) and a smaller one in Oelwerke Julius Schindler. Wintershall operates an 800-barrel refinery in Salzbergen not far from the Emsland oil field, Emlichheim. It has a cracking unit of 420 barrels daily capacity. In the face of the increasing Emsland production, Salzbergen is working to enlarge its capacity to 1,200 barrels.

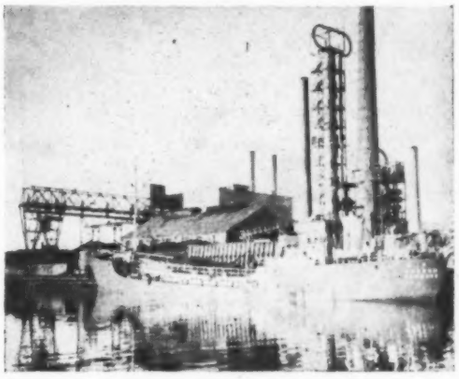
Some smaller plants in the Hamburg harbor district are important as suppliers of special products. Ernst Schliemanns Oelwerke had a considerable export of transformer oil, paraffins and white oils before the war. The plant was bombed out in the war, but after rebuilding it is now operating at full capacity. Johann Haltermann, owner of a gasoline rerunning type of refinery of 1,200 barrels daily capacity, exported industrial benzines, benzole derivatives and other products in former years, especially to Scandinavia. Mineraloelwerke Ernst Jung has a lubricating plant and tank storage facilities on the Elbe.

The present operating crude capacity in western Germany corresponds nearly to the amount of the consumption of mineral oil products in the Bizone in 1947. But less than 50 percent of the country's normal requirements is covered by its refining production from indigenous or imported crude. The larger part of the supplies consisted of gasoline and diesel oil which the Allied authorities released from military stores. In the middle of 1947 the situation was so far clarified that the authorities could count upon a sufficient German refining capacity, and negotiations were begun by the North German Oil Control (now Oil Branch of the Fuel & Power Division) for an import arrangement that would save considerable amounts of dollars by treating crude in Germany instead of importing expensive derivatives. The decision to include western Germany in the European Recovery Program gave promise of aiding the future German economy by making this possible.



Asphalt loading facilities at the Ebano Asphalt Werke, Hamburg—Harburg.

Deutsche Vacuum Oel AG refinery at Bremen-Oslebshausen.



Before the war the Tri-zone area had a mineral oil consumption of about 35 million barrels. Even with a restricted market, the curtailed supplies of the postwar period have been inadequate. It was decided that progressively increasing imports of crude up to 15 million barrels in 1950 were to be provided. Together with about 5,000,000 barrels from indigenous resources, this meant a total supply of 19 million barrels in 1950 or about 55 percent of the oil consumed in western Germany in 1938. The half-year quotas fixed since were 420,000 barrels of Venezuelan crude for the second half of 1947, 850,000 barrels for the first half of 1948 and, preliminarily as a minimum, 1,560,000 barrels for the second half of this year. The first tanker with 95,000 barrels of Venezuelan crude arrived in Hamburg at the end of August last year. Esso Standard had concluded a contract with its German affiliate for delivery of the whole amount foreseen in the Oil Plan of 1947 (60,000 tons). Due to the tanker situation the shipping from Aruba was delayed so that the last tanker finally arrived in April of this year. In the meantime the four Anglo-American market organizations, Esso Standard, Shell, Vacuum and Anglo-Iranian, jointly made contracts for the Oil Plan quantity for the first half of 1948 (120,000 tons). It is hoped that with the easing of the tanker market, these contracts can be met more quickly. For the second half-year shipments of 925,000 barrels of Venezuelan crude and 650,000 barrels of Arabian crude are foreseen. Venezuelan crude will be treated by Ebano, Harburg, Deutsche Shell A.G., Monheim, and Deutsche Gasolin A.G.; Dollbergen and Arabian crude by Deutsche Vacuum Oel A.G., Oslebshausen and Deurag-Nerag, Misburg.

Negotiations are under way to provide a new plan for handling imports. Germany's oil economy was isolated from the world market for nine years. Free trade not yet being possible due to the shortage and the fact of military control, it seemed, nevertheless, advisable to give free action to the German oil import companies as far as possible. The majority of the German importers, united in the Mineraloelwirtschaftsverband, proposed that the issue of import licenses should depend on the actual market shares of the firms concerned. This would give security to the foreign affiliates which have a big showing in the market to arrange import contracts over long periods covering considerable quantities. Some refiners without market organizations and some independent importers opposed the adoption of the proposed basis. Final regulations are not yet fixed, inasmuch as the imports must be made to conform to Marshall Plan deliveries and the European Recovery Program. It seems reasonable to believe, however, that crude imports will be continued and that refining capacity will be built up to meet them.

SHIFTS IN SUPPLY SOURCES INCREASE DEMANDS ON WORLD TANKER FLEET

Small intercoastal tanker of Socony-Vacuum Oil Co.

Shipway being extended at Sun Shipbuilding and Drydock Co. to accommodate keel of new supertanker.

THE marine division of the oil industry today is transporting 4,319,000 barrels of crude oil and products daily by seagoing tankers. In 1938 transportation by tanker averaged 2,947,000 barrels daily. The increase in volume transported since before the war is thus 47 percent. Considering that the world tanker fleet now has a hauling capacity of 63 percent greater than in 1939, it appears superficially that there is a considerable surplus of tanker capacity available to the industry. It is not quite that simple, however. The difficulty is that tankers today must make longer hauls than they did before the war. In 1938 seagoing tankers operated 2,913 billions of barrel-miles. (The transportation of one barrel

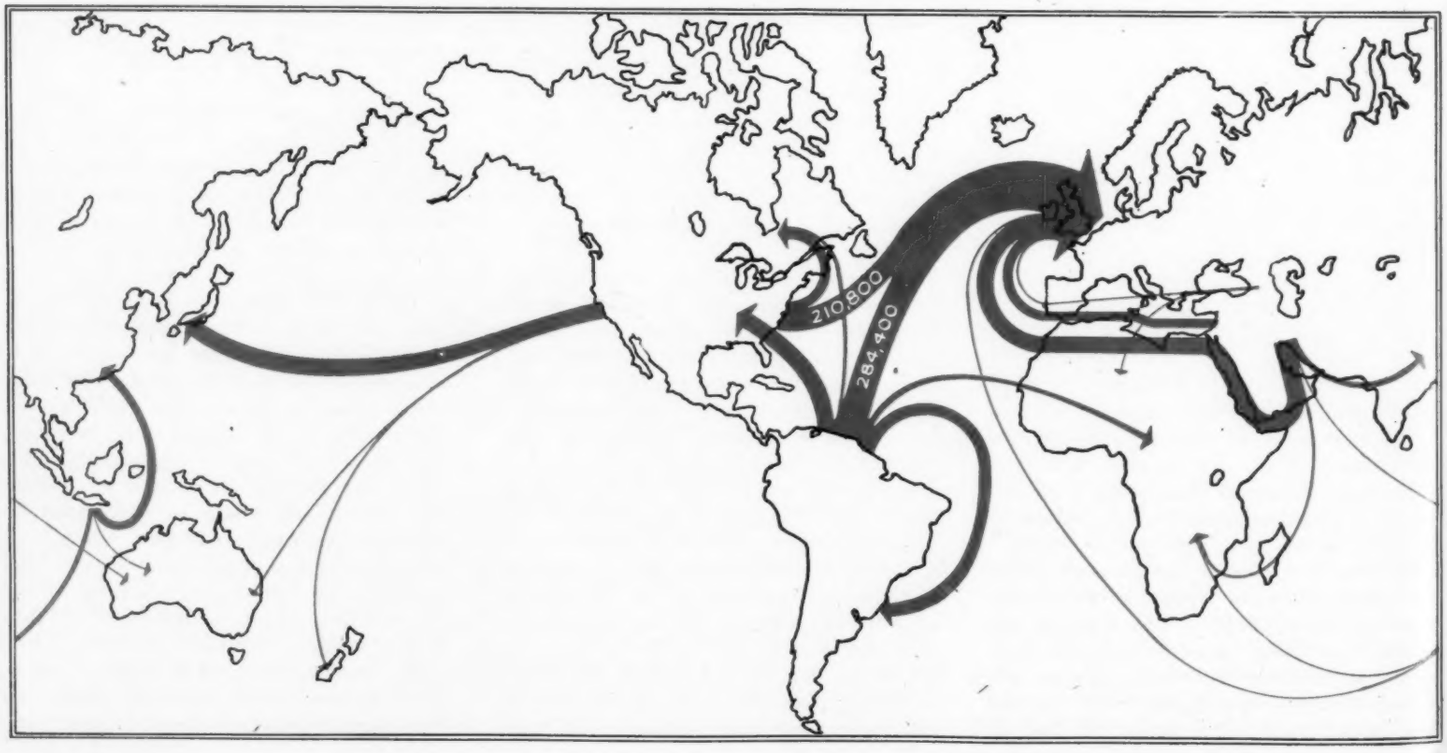
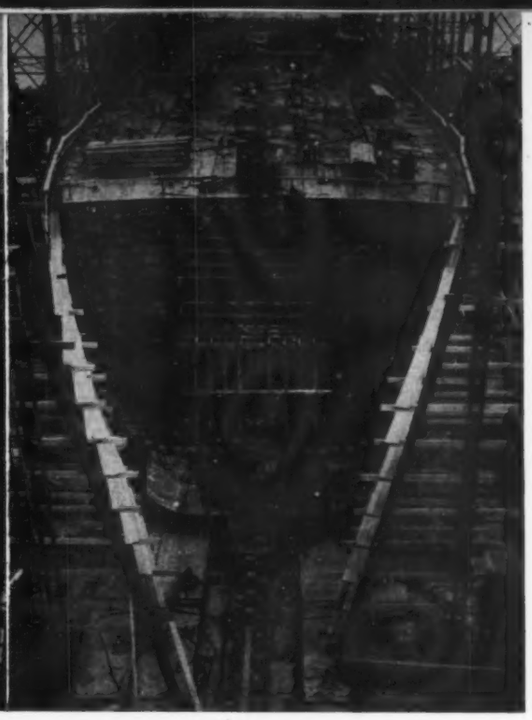


Fig. 1. Intercontinental flow of petroleum and its products in 1938.

Mid-section construction of one of the new 26,000 ton tankers at Sun's Chester, Pa., plant.



Hull of super-tanker in advanced stage of construction by Sun shipbuilders.

of oil one mile is considered a barrel mile.) This year the world tanker fleet will operate 4,525 billions of barrel-miles, an increase of 56 percent over prewar.

The intercoastal service required of United States tankers is 48 percent greater than before the war, while the increase in service required by tankers in intercontinental service is 58 percent greater than in 1938. The deficiency in oil supplies in the Far East and Oceania, where production still is far below prewar, is requiring a long haul of products from the Persian Gulf. Middle East oil also affects the European haul, and today something like 20,000 barrels of Persian Gulf oil is reaching the United States. The round-trip distance from Saudi Arabia to Philadelphia is 17,000 nautical miles compared with about 3,700 between U. S. Gulf ports and Philadelphia, and about 3,800 miles to Venezuela. Tanker requirements in terms of barrel-miles are about 4.5 times as great when oil must be brought to the United States from Saudi Arabia than when it is imported from Venezuela.

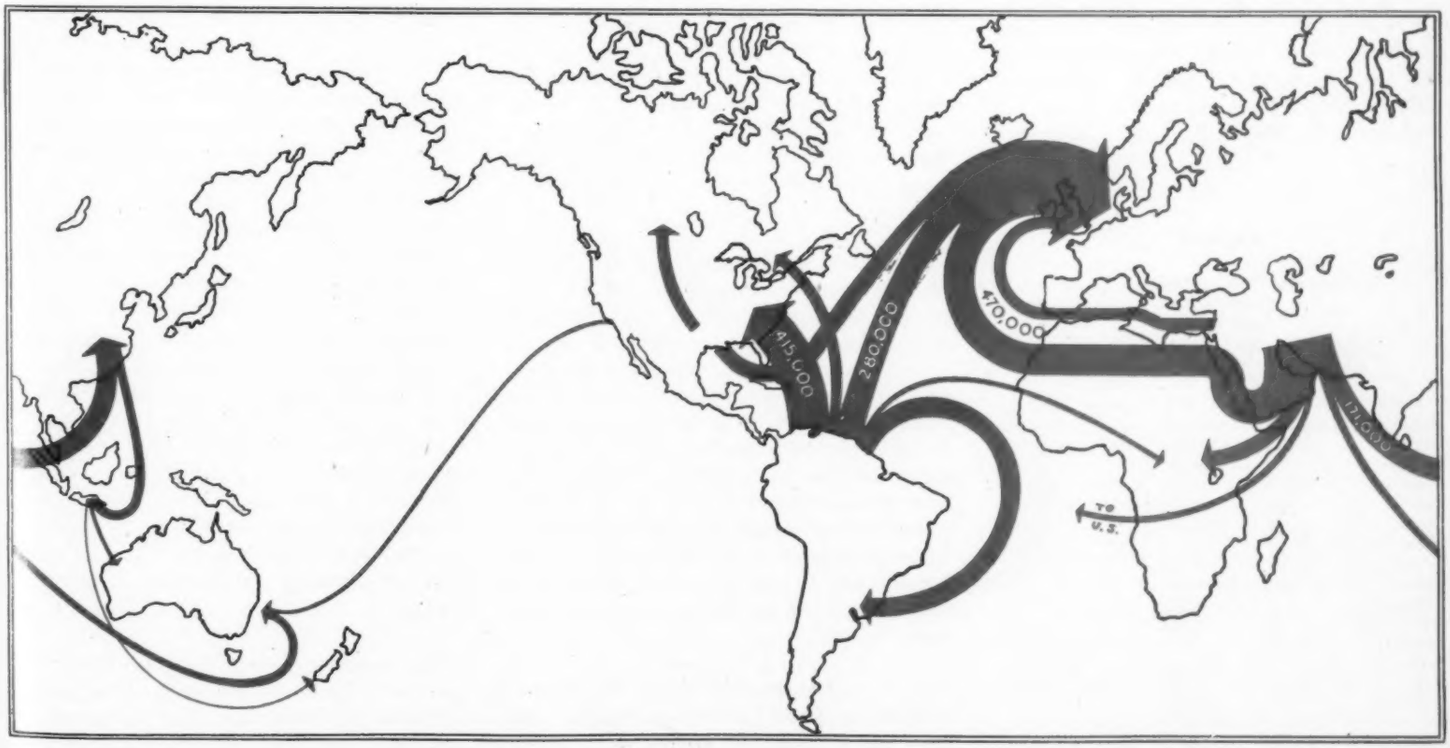
In 1938 the western hemisphere was shipping 627,000 barrels of crude and products daily to the eastern hemisphere. As shown in Fig. 1 prepared by C. J. Bauer of the foreign economics department of Standard Oil Co. (N. J.), the United States was then shipping 210,800 barrels of oil per day to Europe and 134,000 barrels daily to Oceania and the Orient from California. Latin America was shipping 284,400 barrels daily to Europe.

Based on operations in the first half of 1948, Fig. 2 has been prepared to show the large change in intercontinental flow of oil products since the war. The United States now is shipping only about 180,000 barrels of petroleum to Europe and about 25,000 barrels daily to Oceania and the Orient. Latin America also is reducing its shipment outside the western hemisphere. Current rate of shipment from the Caribbean to Europe is about 280,000 barrels daily. But shipments to the United States have risen to about 415,000 barrels daily. Southern Latin American nations also are requiring much larger shipments of oil than before. The daily flow from the Caribbean to southern republics now averages about 180,000 barrels daily.

Outside of Russia demand for oil in Europe this year is in excess of 1,100,000 barrels daily and domestic supply only 130,000 barrels daily. About half of the deficiency now is being made up by inshipments from the Middle and Near East where there is a current exportable surplus of some 800,000 barrels of oil daily.

Until the new pipelines across Arabia are complete, the average tanker haul from the Persian Gulf to Europe is even greater than that required to bring the same amount of oil from the western hemisphere. The large deficiency in oil production in the Far East also is a factor in the

Fig. 2. Intercontinental flow of petroleum and products in 1948 based on first half year operations.



demand for tankers. Last year the Far East was 350,000 barrels daily short of supplying its own needs. This year production in Oceania has increased rapidly, but the shortage of nearby oil has not diminished appreciably because of the growth in demand. Before the war the Far East and Oceania were not self-supporting in oil production, and there is no indication that they will reach that status soon.

When proposed pipelines across Arabia to the Mediterranean are completed, the load on tankers will be far less severe than at present. Some 7,000 round trip miles will be cut off the tanker trip from the Persian Gulf to the United States or to Europe. T-2 tanker turnaround time from Ras Tanura to western Europe is 40 days compared with 22 days from pipeline terminals on the Mediterranean coast. Completion date for these lines still is problematical, with the result that demand for tankers will continue to increase more rapidly in the next few years than will the demand for petroleum products.

Taking 1948 tanker movement in terms of barrel-miles as 100, one large oil company with world-wide shipping estimates tanker requirements for the next few years to be as follows:

Year	International	U. S. Intercoastal	World Total
1948	100	100	100
1949	107	103	106
1950	114	106	112
1951	121	109	119

It is this prospective increase in demand for tankers that is responsible for the large orders recently placed with shipyards for the construction of new super-tankers most of which will have a cargo capacity of around 228,000 barrels each and a speed of 16 knots. Standard Oil Co. (N. J.), for example, recently placed an order for eight more of these great vessels, bringing the number to 14 that that company has ordered within the past six months. The cost of these 14 will be in excess of $75 million. Standard of California has ordered five new tankers of an even larger type which will cost $6 million each.

Table I

World Tanker Fleet on Order or Under Construction
April 1, 1948
(U. S. Maritime Commission Data)

	Actual		T-2 Equivalent	
Country	No. Ships	D.W.T.	No. Ships	D.W.T.
United Kingdom	87	1,085,190	56.1	940,500
Norway	113	1,895,600	109.5	1,835,700
Denmark	6	100,200	5.9	98,900
Sweden	16	273,750	16.4	275,000
Panama	4	69,400	4.1	68,700
Greece	8	138,400	8.0	134,100
United States	29	755,800	49.5	829,900
France	15	235,780	13.2	221,300
Italy	2	6,000	0.2	3,400
Argentina	7	94,500	6.2	103,900
Netherlands	3	36,700	1.9	31,900
Portugal	3	36,500	2.0	33,500
Spain	3	32,400	1.7	28,500
Belgium	1	16,500	1.0	16,800
Unknown	5	69,950	4.0	67,100
Total	302	4,846,670	279.7	4,689,200

The Standard of California tankers will have a deadweight capacity of 28,000 tons each and a cargo capacity of 240,000 barrels. Largest ship now in the California company's fleet is of 18,000 deadweight tons. In announcing the placement of orders for these new ships, T. S. Petersen, president of Standard of California, said that in 1950 and 1951 when they are scheduled for delivery, the company anticipates that it will be importing much larger quantities of crude than at present. It is planned to put them into service between Venezuela and the United States.

On April 1 there were 27 tankers under construction or on order at United States shipyards with an aggregate deadweight tonnage of 707,800. It is significant that the 27 ships will be equivalent in carrying capacity to 46.4 wartime T2-SE-A1 tankers according to calculations of Benedict Saurino of Sun Oil Co. In making his calculations Mr. Saurino used the wartime performance of the 16,765 DWT T-2 and a speed of 14.5 knots.

U. S. Maritime Commission data indicated that there were 302 tankers with a deadweight tonnage on order or under construction on April 1, 1948. Ownership of the vessels, number, tonnage and T-2 equivalence are indicated in Table 1. The tabulation indicates that outside the United States the tendency still is to build ships of somewhat less cargo capacity and speed than in the United States. Lower labor cost of operation in other countries may be largely responsible for this. Other factors include volume of individual shipments required.

Completion of the tankers building or on order as of April 17 will increase the deadweight tonnage of the world tanker fleet 20 percent to 28,539,070 DWT. In terms of T-2 equivalents completion of the new ships will add 22 percent to the carrying capacity, bringing it up to a T-2 equivalent of 25,885,200 compared with the April 1 figure of 21,196,000. Table 2 shows the world tanker fleet as of March 31 in number and actual tonnage and in terms of T-2 equivalent. For a comparison with prewar Table 3 shows the change in number of ships, deadweight tonnage and T-2 equivalent from September 1, 1939, to April 1, 1948.

On the basis of the figures in these tables the National Petroleum Council has concluded that enough ships are available to handle the peak load of shipping during the coming winter. As shown above, the carrying capacity of the world fleet is 63 percent greater than in 1939, and the transportation demand in barrel-miles is about 156 percent of 1938. Another safety factor is that the industry has been diligent in recent months in erecting new storage tanks on the Atlantic seaboard where transportation was a bottleneck last winter. Many millions of gallons of new storage capacity have been built and will be filled before the home heating season gets under way.

Since the Maritime Commission figures were compiled on April 1 American shipyards have more than doubled their backlog of orders for tankers. The trend toward super-tankers has continued. On April 1 the orders for ships of this type totaled 15 and on August 1 45 super-tankers were on order.

Of the 63 seagoing vessels under construction August 1 in United States yards, 54 were tankers and nine were cargo vessels. Only nine of the tankers will have a deadweight tonnage of less than 26,000. Largest ships on order or under construction are two of 30,000-ton capacity being built for Oceanic Tankships, S.A. In addition to the five of 28,000 DWT capacity ordered by Standard of California, the Texas Co. and Gulf Oil Corp., each have four 28,000-ton ships ordered or building. Foreign interests have placed orders in the United States for six of the 28,000 DWT ships.

In the 26,000-DWT class Standard Oil Co. (N. J.) has placed orders for 14 ships; Socony-Vacuum Oil Co., Inc., has ordered seven, Gulf Oil Corp. two, and N. G. Livanos one.

Size of the two 30,000-WDT ships ordered by Oceanic Tankships is 616 feet by 84 feet by 43 feet nine inches. Turbine horsepower will be 17,500, compared with 13,750 for the 26 and 28,000 ton ships. The 28,000-ton ships measure 595 by 84 by 44 feet, and the 26,000 tons 600 by 82½ by 42½ feet.

Keels had been laid on August 1 for only ten of the 54 ships on order. Completion dates extend into 1951.

Scottish shipyards are now busy with tanker construction. Harland and Wolff at Govan and Belfast have 29 oil tankers building or on order. Among them are a group of five, each capable of carrying a deadweight of 24,000 tons, for Norweigian owners, one of which is being built at Govan and is the largest tanker, to the extent of about 5,000 tons carrying capacity, on order from a Clyde shipyard. The Scottish tanker construction program covers a total of 50 vessels, of some 677,500 tons carrying capacity or about 450,000 tons gross. Norwegian owners have 27 such tankers on order, of 370,000 tons deadweight, three of which have already been launched. British owners have 19 tankers of 238,000 tons deadweight on order, including the British Ranger, now completed.

Panama has orders on hand for three tankers to a total deadweight of 55,000 tons. Sweden has a 13,500-ton tanker on order, and Norway a similar vessel. Largest concern involved in this program is the British Tanker Co. It alone has 15 tankers on order in the Clyde from Lithgows, Blythswood and Harland and Wolff yards. Highlight of the program will be the launching of the British Mariner on Sept. 15, when Princess Margaret will perform the launching ceremony.

First Appendix to Lloyd's Register Book since pre-war recently was published. This register revealed that British war losses of tankers had been made good by June 1947 and that enlarge-

Table II

World Tank Ship Fleets by Flag and T2-SE-A1 Equivalents as of April 1, 1948

Vessels 2,000 Gross Tons and Over

(Source: U. S. Maritime Commission)

Flag	Actual March 31, 1948 No.	D.W.T.	Average Speed Knots	T2-SE-A1 Equivalent No.	D.W.T.	As % of World
WESTERN HEMISPHERE						
United States	621	9,395,500	14.0	541.9	9,085,000	42.9%
Government	206	3,042,300	14.5	181.8	3,047,900	14.4
U.S.M.C.	117	1,534,800	13.2	83.2	1,394,800	6.6
Military	89	1,507,500	15.9	98.6	1,653,100	7.8
Private	415	6,353,200	13.8	360.1	6,037,100	28.5
Oil Companies	290	4,402,700	14.0	246.7	4,135,000	19.5
Non-Oil Companies	125	1,950,500	13.3	113.4	1,901,200	9.0
Panama	168	2,158,300	12.8	113.7	1,906,200	9.0
U. S. Citizen	119	1,536,700	12.9	81.5	1,366,300	6.4
Canada	18	187,100	13.1	10.0	167,600	0.8
Others:						
Argentina	26	232,800	11.5	11.0	184,400	0.9
Brazil	5	44,000	10.2	1.8	30,200	0.1
Chile	2	9,600	11.0	0.4	6,700	—
Honduras	2	21,000	11.3	1.0	16,800	0.1
Mexico	12	114,600	10.5	5.0	83,800	0.4
Peru	1	4,300	10.0	0.2	3,400	—
Philippines	—	—	—	—	—	—
Uruguay	2	33,600	14.5	2.0	33,500	0.1
Venezuela	26	104,500	9.9	4.2	70,400	0.3
Sub-Total Others	76	564,400	11.1	25.6	429,200	2.0
TOTAL WESTERN HEMISPHERE Incl. Canada & Philippines	883	12,305,300	13.6	691.2	11,588,000	54.7%
EUROPE						
E.C.A. Countries	913	10,700,100	12.2	539.9	9,051,400	42.7
Belgium	5	58,500	12.2	2.9	48,600	0.2
Denmark	11	149,400	11.8	7.2	120,700	0.6
France	43	568,200	12.9	30.1	504,600	2.4
Germany	2	22,700	9.6	0.9	15,100	0.1
Greece	11	149,100	13.5	8.3	139,100	0.7
Italy	56	662,800	12.6	34.4	576,700	2.7
Netherlands	86	619,900	11.3	28.9	484,500	2.3
Norway	208	2,740,400	12.0	139.1	2,332,100	11.0
Portugal	6	59,100	11.9	2.9	48,600	0.2
Sweden	36	506,000	13.5	28.1	471,100	2.2
Switzerland	2	17,900	10.3	0.8	13,400	0.1
Turkey	3	30,000	13.7	1.7	28,500	0.1
United Kingdom	444	5,116,100	12.1	254.6	4,268,400	20.1
Others:						
U.S.S.R.	26	275,100	11.8	13.4	224,700	1.1
Spain	22	179,700	11.4	8.4	140,800	0.7
Yugoslavia	1	9,400	11.5	0.4	6,700	—
Finland	4	44,100	10.5	1.9	31,800	0.1
Poland	1	9,300	10.5	0.4	6,700	—
Sub-Total Others	54	517,600	11.5	24.5	410,700	1.9
TOTAL EUROPE	967	11,217,700	12.2	564.4	9,462,100	44.6
JAPAN	7	85,900	13.3	4.7	78,800	0.4
CHINA	3	44,500	10.0	1.8	30,200	0.1
UNION OF SOUTH AFRICA	2	33,600	14.5	2.0	33,500	0.2
INDIA	1	5,400	8.0	0.2	3,400	—
TOTAL WORLD FLEETS	1,863	23,692,400	12.9	1,264.3	21,196,000	100.0
TOTAL GREAT BRITAIN AND DEPENDENCIES	465	5,342,200	12.1	266.8	4,472,900	21.1

Table III

Change In World Tank Fleets Between September 1, 1939 and April 1, 1948

Vessels 2,000 Gross Tons and Over

(Source: U. S. Maritime Commission)

Flag	Increase or Decrease to April 1, 1948, from Sept. 1, 1939 Actual Change No.	D.W.T.	T2-SE-A1 Equivalent Change No.	D.W.T.	Per Cent*
WESTERN HEMISPHERE					
United States	+238	+4,961,400	+356.6	+5,978,400	292.4%
Government	+184	+2,759,700	+164.4	+2,756,200	1,044.9
Military	+ 67	+1,224,900	+ 81.2	+1,361,400	566.7
U.S.M.C.	+117	+1,534,800	+ 83.2	+1,394,800	—
Private	+ 54	+2,201,700	+192.2	+3,222,200	214.5
Panama	+115	+1,425,500	+ 79.1	+1,326,100	328.6
Others:					
Argentina	+ 2	+ 41,600	+ 2.1	+ 35,200	123.6
Brazil	+ 3	+ 31,800	+ 1.3	+ 21,800	359.5
Chile	—	—	—	—	100.0
Honduras	+ 1	+ 9,800	+ 0.4	+ 6,700	166.3
Mexico	+ 10	+ 100,100	+ 4.3	+ 72,100	716.2
Peru	—	—	—	—	100.0
Philippines	— 1	— 7,700	— 0.3	— 5,000	0.0
Uruguay	+ 2	+ 33,600	+ 2.0	+ 33,500	—
Venezuela	+ 3	+ 17,200	+ 0.6	+ 10,100	116.7
Sub-Total Others	+ 20	+ 226,400	+ 10.4	+ 174,400	168.4
TOTAL WESTERN HEMISPHERE	+373	+6,613,300	+446.1	+7,478,900	289.7
EUROPE					
Great Britain	+ 23	+ 638,200	+ 47.9	+ 803,000	121.9
Norway	— 55	— 385,000	— 11.8	— 197,700	92.2
Netherlands	— 19	— 120,100	— 5.0	— 83,800	85.3
France	— 1	+ 105,900	+ 8.1	+ 135,800	136.8
U.S.S.R.	+ 9	+ 112,600	+ 5.8	+ 97,300	176.4
Germany	— 32	— 365,000	— 17.4	— 291,700	4.9
Italy	— 24	+ 44,100	+ 7.4	+ 124,000	127.4
Sweden	+ 16	+ 249,000	+ 15.4	+ 258,200	221.3
Others:					
Belgium	— 5	— 42,600	— 1.9	— 31,900	60.4
Denmark	— 2	— 15,000	— 0.5	— 8,400	93.5
Finland	+ 3	+ 34,300	+ 1.5	+ 25,100	474.6
Greece	+ 4	+ 101,000	+ 6.3	+ 105,600	415.2
Poland	+ 1	+ 9,300	+ 0.4	+ 6,700	—
Portugal	+ 5	+ 55,900	+ 2.8	+ 46,900	2,858.8
Roumania	— 3	— 22,600	— 1.0	— 16,800	0.0
Spain	+ 9	+ 80,400	+ 3.6	+ 60,400	175.1
Switzerland	+ 2	+ 17,900	+ 0.8	+ 13,400	—
Turkey	+ 2	+ 23,800	+ 1.6	+ 26,800	1,676.5
Yugoslavia	—	+ 6,100	+ 0.3	+ 5,000	394.1
Sub-Total Others	+ 16	+ 248,500	+ 13.9	+ 232,800	166.1
TOTAL EUROPE	— 67	+ 528,200	+ 64.3	+1,077,900	112.6
JAPAN	— 40	— 526,600	— 23.5	— 394,000	16.7
CHINA	+ 3	+ 44,500	+ 1.8	+ 30,200	—
EGYPT	—	—	—	—	—
TOTAL WORLD	+269	+6,659,400	+488.7	+8,193,000	163.0

* Does not indicate percentage change, but is a percent of Sept. 1, 1939.

ment of the fleet continues. Commenting on ships themselves Lloyd's reports that steam turbine driven tonnage has increased very markedly as compared with internal combustion engine driven tonnage. Contrary to the trend Anglo-Saxon Petroleum Co., Ltd., recently accepted the Auris from its builders. The Auris is a notable departure from normal British tankers being diesel-electric driven.

Shell interests have ordered three 28,000 DWT tankers to be built in British yards. Keel for the first was laid on June 20 at Swan, Hunter and Wigham Richardson's shipyard at Wallsend-on Tyne. In addition Shell interests have ordered five 28,000-ton tankers in the United States for 1950 delivery from Bethlehem yards at Quincy, Mass. Orders were placed by Atlas Tankers, Inc., and will be chartered to Anglo-Saxon Petroleum Co. The eight new supertankers will be used to carry Middle East crude to Shell's new refineries building in England at Shell Haven and Stanlow and on the continent.

It was stated last winter that the margin by which the supply of domestic fuel in customers' tanks failed to meet demand was only 0.5 percent. This was in a season with average temperatures some seven percent below normal. With any sort of reasonable weather in the 1948-49 winter, transportation should not prevent delivery of adequate oil supplies throughout the world.

PETROLEUM ECONOMY IN A CHANGING WORLD

BY RUTH SHELDON

FORTUNATELY or unfortunately as the case may be, the world oil industry is not in the position today of the farmer who summarily dismissed the county agent's offer of advice with the retort, "I aint farmin' half as well as I know how now!" The industry is not only operating as well as it knows how, but has responded to the pressure of world demand since the close of the war with Olympiad feats of development. But even this has not been enough to satisfy all of today's needs.

As to the future, there is general agreement that the next five years or so will be as critical and challenging a period as the industry has ever been called upon to face.

Paradoxically, the basic aspects of the situation are such as apparently would warrant painting an optimistic picture of the future. Never in the history of the world has there been a greater demand for oil. Next to food it is the most important factor in living today and is the essential item in the reconstruction and expansion of the modern world. For the first time in history world production exceeded three billion barrels last year, and proven world reserves are over 20 times that annual production. Furthermore, it is geologically estimated that only one-sixth of the world's potential oil resources have been discovered. Technologically, in every branch the industry has made rapid strides and comparatively is more advanced technically than any other industry. Financially, enough capital is available to meet the tremendous expansion required by the growth of demand, and profits are high on the basis of current operations.

All this makes stimulating reading to any of the two billion stockholders in the world's oil resources. So what's wrong with the annual report? A little detailed reading of the balance sheet is required to show just how things stand.

The industry has been changed and shaken to its foundations during this decade of the 40's by a series of major upheavals as violent and dramatic as those by which nature herself created traps for oil.

World War II was the cause or catalytic agent for many of these changes, but others were already in the making. The total postwar effect, however, makes today's oil man feel like Alice when she stepped through the looking glass.

In this new oil world, the United States has undergone the greatest change and proportionately faces the greatest problems. From having been the traditional supplier of the majority of the world's oil needs, the United States this year became for the first time in its history a net oil importing nation.

This is not exactly a surprise. For a number of years members of the oil industry have become used to the thought that with only an estimated one-sixth of the world's ultimate potential resources, there would come a day when the United States no longer could provide the world with two-thirds of its daily oil needs. But like the expected death of a beloved, very old person, the event itself still comes as a shock. It seems hardly believable that the country has ended one era and launched on a new, uncomfortable and precarious one where, as Max Ball, director of the Oil and Gas Division of the Department of Interior, has stated, "though the United States will not run out of oil for many years, it could run short of oil this year, or next year, or in any year thereafter."

Consumption, of course, has reached levels which once would have seemed fantastic, with United States consumers requiring more oil today than the entire world did just before the late war and with the ceiling on demand not yet in sight. Most significant factor, however, is what happened one day in 1946. It is doubtful that even the average oil man realizes that this was as important a year in United States oil history as was 1859 when the Drake well was drilled in, for in 1946 oil and gas for the first time assumed the role of chief supplier of United States mechanical energy. The entire national economy is now dependent upon ample supplies of the oil which the country can no longer find and produce fast enough within its own borders to satisfy its full needs.

The complete reversal of the United States oil position in the world has fortunately, from the viewpoint of overall world supply sources, been accompanied by a corresponding development of the Middle East's fabulous resources. But this new center of gravity of world oil, as E. DeGolyer so aptly named it, cannot yet fulfill its scheduled role. An oil man hardly dares stick his head up from behind a rock in parts of that troubled area and must still wait for materials with which to finish the pipelines which will channel larger quantities of Middle Eastern oil into thirsty European markets.

For this reason the European Recovery Program, contrary to the expectations of its framers, must still depend upon the western hemisphere for the majority of its requirements, although it had previously been estimated that of the total 950,000 barrels a day import needs of ECA countries, supplies from the western hemisphere would decrease from 61 percent of this total in 1948 to 20 percent in 1952, with the Middle East increasing proportionately as a supplier.

As, if and when the development of the Middle East can proceed with adequate equipment and without political or armed interference, it will become the chief supplier of Europe as well as a supplemental source for the needs of the western world.

The urgencies of today must be met, however, regardless of the possibilties of tomorrow. The requirements of the European Recovery Program as stated above are not the maximum the European countries could use, but what has been estimated as the greatest quantity it is possible to give them under present conditions. Their original requests were 20 percent higher. Even scaled down, this supply of petroleum and petroleum products will account for one-fifth or more of the cost of the entire $5 billion ECA program.

In order to take care of both its own essential supplemental needs and its basic European commitments, the United States must look to the rest of the western hemisphere. Here again it is faced with another of the upheavals of this decade. Nationalism has been on the march in Latin America, and its greatest economic effect has been a gradual closing of the door to oil development by foreign interests. It is axiomatic that the oil used today is the result of exploration and development begun five or more years ago. Although statistically Latin American oil production has increased, it has not increased at the rate its potentialities warrant, and exploratory development is decreasing due to unfavorable nationalistic policies.

The western hemisphere's present margin of productive capacity is so slim and its sources so interdependent that a major oil company executive testified before a recent congressional hearing that if fourth quarter steel requirements are not available for American producing companies in Venezuela, there will be "cold homes on the east coast of the United States this winter." The prediction may not be realized statistically, but it reflects the tightness of the supply situation.

The world oil industry was unprepared for the rapidity with which all these factors have become realities. As late as the end of 1945 the industry's most expert petroleum economists reported to a special United States Senate committee that the rate of consumption which prevails today would not be reached before ten years hence.

The fact that postwar demand started out at the level where it probably would have been if there had been no war and began an extraordinary increase put the world oil industry in the fix of a champion who has just won a marathon race and is forced to start another one immediately without pausing for breath. This is a new course too and equally as tough.

The steel shortage is a major aggravation of the current inadequate supply. Rapid development of new production both in the United States and outside areas is hampered by the limited amount of casing available. Expansion of refining capacity and rebuilding of European refineries is also hampered by lack of steel. Capacity simply did not exist to turn out the great quantity of large-diameter line pipe for which demand suddenly arose. Almost out of sheer ingenuity the industry has been able to increase refining throughput since the end of the war, but runs are so close to total capacity that it is obvious they canont be maintained indefinitely. Just as in refining, transportation of every kind is operating at capacity—pipelines, tank cars and tankers. More of all of them are needed everywhere in the world. Steel again is the bottleneck.

These are factors aggravating the basic bottleneck which is supply. Nor will the solution of the steel shortage change the position of the United States as a net importing nation. We have found our easy oil. Remaining reserves are more difficult and costly to find.

This means that in regard to oil the United States has a major national defense problem. Secretary of Defense Forrestal has stated that in the event of war the nation would be 2,000,000 barrels a day short of petroleum supply. That is the amount which top military authorities believe would be required from the start of a new conflict.

Before World War II the United States had a productive capacity reserve of a million barrels daily, observing the maximum efficient rate of production. During the latter half of 1944 and all of 1945 it was forced to produce in excess of its efficient capacity. Even so, and in spite of rationing, the United States could not meet all the oil needs of the military forces and essential civilian demand as well; the balance came from outside fields. The amount saved by rationing was only roughly equal to the daily output of 100-octane aviation gasoline during the latter part of the war.

Today's critical situation from the viewpoint of national security stems from the fact that the country has no such reserve capacity production potential as formerly, nor does any exist elsewhere in the western hemisphere. Furthermore, as Secretary Forrestal has stated, military requirements for another war would be double those of World War II, and essential civilian requirements would be much higher; hence the estimated two million barrel deficit in case of hostilities.

If War No. 3 should be of worldwide extent as was the recent conflict in its later stages, the Middle East would be of immense strategic importance, but under certain circumstances it might conceivably be shut off from access to the western hemisphere. Alternate sources of supply now visible are confined to synthetic production and Latin America.

The House Armed Services petroleum subcommittee, which conducted extensive hearings from January through March on this question of oil in relation to national defense, found the position of the United States so precarious that it recommended that the Department of State and military, naval and air force representatives vigorously present the problem "in its stark reality, so that the South American leadership will realize that our position stems exclusively from facts now existing rather than from ulterior considerations, which in the past on occasion have prevented the acceptance of our views."

Latin American leadership protested openly that it had done and was doing its share in terms of hemispheric defense and to date apparently there has been no further discussion of the subject.

Synthetics, of course, is the ultimate answer to any great increase in domestic supply, either for peace or war. The Synthetic Liquid Fuels division of the Bureau of Mines has prepared a detailed report for the armed services, on which more than 1,000 people collaborated, outlining how the 2,000,000-barrel daily war deficit could be supplied synthetically. In such an event time, not cost, is the governing factor. Although the report itself is secret, it is no secret that even in respect to cost, granted continued high prices for natural petroleum, synthetics are not too far behind competitively. Private industry is already building one plant to produce synthetic gasoline from natural gas, and various oil companies are spending millions of dollars in cooperation with the government on pilot plants and experiments with oil shale and coal throughout the country.

However, any synthetic program of such scale would require more time than perhaps would be available. The United States is sitting uneasily on top of its stockpile of atomic weapons and meditating on the National Security Resources Board's warning that "the only lead time we can depend on is that required by a potential enemy to produce and be able to deliver atomic bombs, plus whatever time may be obtained by diplomacy."

Time, then, from every angle—that of national defense, war emergency or peacetime supply of constantly growing demand—is what makes the world oil situation critical today.

Oil company executives are actually working under greater pressure than they did during the war. Not only are they wrestling with all the problems already discussed, but like the oil men they are, they are finding ways in spite of every obstacle to attempt development in new areas. Most recent example is that of the American Independent Oil Company, whose first boatload of material has already been unloaded in Kuwait, near the Middle East concession it recently acquired.

This venture is significant as it marks a new departure in foreign prospecting with the banding together of nine companies outside the major classification to make a single "blue chip" unit to cope with the expensive hazards of the foreign game. Other smaller companies have recently tried or are trying to operate abroad alone, but the American Independent Oil Company amalgamation will probably set the pattern as the most satisfactory means of increased foreign activity by those American units which are finding less crude at home.

Whether such efforts, added to those of the major companies already established abroad, are successful in the long run in providing the United States and the world with its necessary oil depends upon the conditions under which foreign countries will permit their resources to be developed by American capital and technical talent.

It is no accident that Americans are the oil-finders of the world. Nor is it simply because they have the capital to invest in such ventures and the inclination to do so. One of the basic reasons has been succinctly pointed out by Wallace Pratt, one of the world's leading economic geologists, who even denies that American success in finding oil is due to superior geological ability. "Russian geologists, British, German and French geologists are generally better informed," he states, "more thoroughly trained in fundamental concepts and often more brilliant than American geologists. Americans excel only in applying an adequate knowledge of geology more effectively and more extensively to the search for oil. In a country where class distinctions bar intimate collaboration between scientist and laborer as fellow workers, or where government prohibitions or social habit deny the wildcatter freedom to drill exploratory wells throughout the land, the American method of oil finding would fail."

That is why other countries do not develop comparable oil finders themselves, and that is why, when through restrictive legislation, American oil finders are excluded from a foreign country, oil development is apt to become turtle slow.

The United States has traditionally stood for the open door policy, but one door after another is being closed these days. American oil companies can hardly do more than keep their foot in the door and pray their salesmanship will prevail. But in a world where outside the United States almost every country's oil resources are owned by the governments themselves, the open door for oil development is a policy that must be established by agreement between governments.

Since the ill-starred and badly bungled 1943-47 attempt to adopt an Anglo-American treaty concerning basic oil policy agreement, the foreign oil policy of the United States has been of the hands-off-the-whole-problem variety. The treaty, now growing moldy somewhere in the Senate graveyard, is unlikely to be revived, nor would it, in anybody's opinion, serve any useful purpose today as it is an outmoded document. Only a multilateral oil agreement among producing and consuming nations would today serve the original purpose of the proposed Anglo-American treaty.

(Continued on page 104)

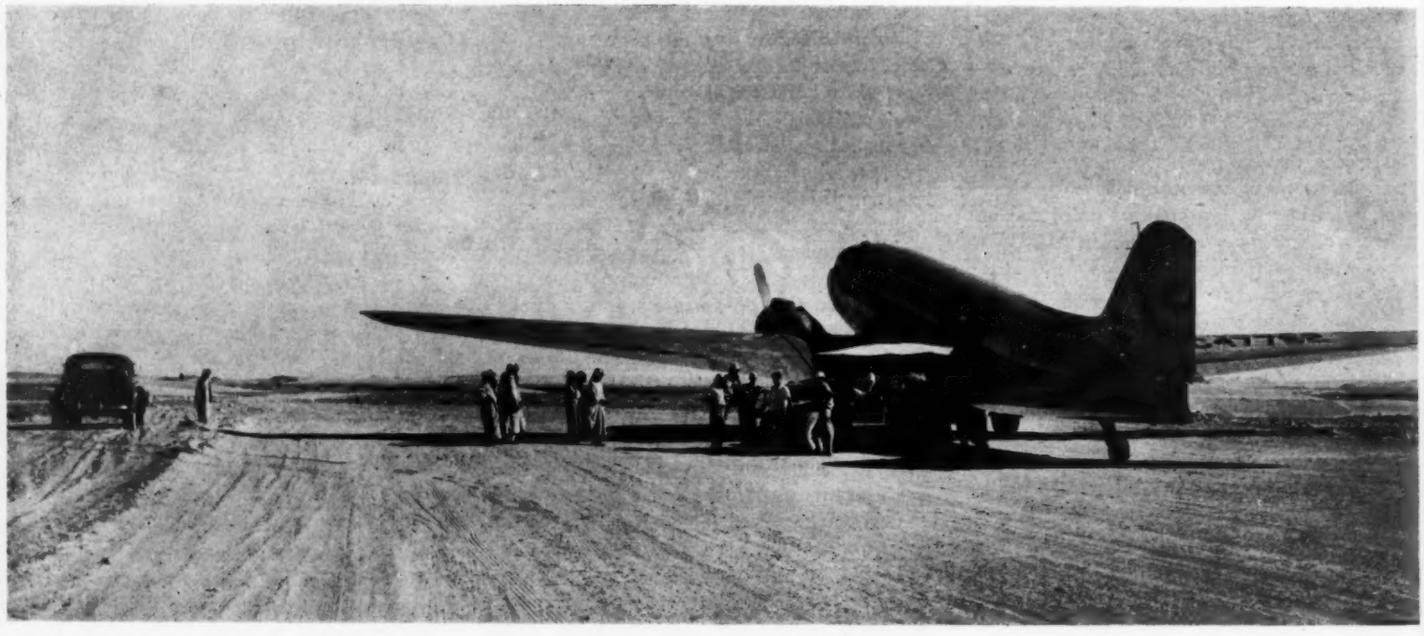
CENTURIES

BRIDGED IN

15 YEARS

Ring girders for sections of the 30-inch Trans-Arabian Pipe Line, strung but not yet bolted in place.

One of the Aramco planes at a desert airport.



OIL has worked astonishing changes in many quarters of the globe. It has planted modern towns in once impenetrable jungles, has transformed barren wastes into thriving communities and has found sources of wealth and progress in seemingly useless swamps and marshes. Nowhere else in the world, however, has it accomplished such revolutionary changes in so short a time as in the sandy wastes of the Middle East. Here in the short space of fifteen years it has bridged a period of as many centuries, profoundly affecting the lives and habits of a people who had been almost untouched by the changes that swept over the outside world.

When the first American geologists landed on the shores of the Persian Gulf in 1933 to undertake the search for oil in Saudi Arabia, they were explorers in a land as strange to them as possibly could be imagined. Few of their kind ever had penetrated more than a few miles into the interior. To the people of the country the visitors themselves were so unusual in appearance that they not unnaturally were regarded with suspicion. This attitude gradually changed, however, as the newcomers showed their friendly intentions. Many of them for their own comfort and to make themselves less conspicuous adopted Arab dress and learned to speak the language of the country. To the credit of both sides it may be said that in succeeding years there have been no serious disagreements, and both native and alien have learned to respect and like each other.

On the physical side the difficulties to be overcome were many. In the areas to be surveyed there were no roads, no towns, no houses. When the first geological crews started out, they had to resort to camelback to reach the points where surveys were to be made. Later on they were provided with motor trucks specially equipped to travel across the desert sands, to carry larger quantities of supplies and to furnish shelter when needed. When drilling crews arrived, it was necessary to build roads over which trucks could move machinery to the well sites selected. Temporary quarters had to be erected, and when oil was found, these gave place to modern homes fitted for permanent occupancy.

As production increased, it was necessary to lay pipelines from fields to coast, to provide anchorage for tankers and to construct schools, hospitals and recreation facilities for the growing population of oil workers and their families. Finally, with the erection of a large modern refinery with its huge towers, power plant, machine shops and flock of storage tanks, the oil industry population was largely increased, and the extent of public utilities en-larged.

Today the town that serves as headquarters for the Arabian-American Oil Company is a thoroughly modern community with homes provided with all up-to-date conveniences, with swimming pools, playing fields, movies and libraries. Here in the short space of fifteen years it has realized all the progress in industrial advancement and living comfort that the world has accomplished since the dark ages.

From the beginning the majority of the oil company's employees have been natives of the coun-

try, Bedouins. They have shown surprising aptitude for mechanical occupations and have quickly accustomed themselves to the new kind of life that has been brought to their doors. The influence of the oil company, however, has by no means been confined to the immediate area in which it operates. Roads have been built, water wells drilled. Schools and hospitals have been established. Through irrigation a growing agricultural industry has been brought into existence, and the living standards of great numbers of people have been improved.

While the transition from a pastoral era to one of advanced industrialization has taken place with breathtaking rapidity, the change in some respects has been made in a single jump, so to speak, without passing through the slow intervening stages that marked its course in the world at large. This is particularly true of transportation. No great system of highways has been or is likely to be built. There has been no era of railway expansion, and automobiles, while they are now familiar objects, do not abound. Saudi Arabia has moved in a single step from the most primitive to the most advanced form of transportation. Thousands of camels still follow their trails, but for covering distance and definitely for oil industry operations, reliance is placed upon planes.

The oil fields of Arabian-American Oil Company are located eight thousand miles from its offices in New York, practically half around the world from the San Francisco headquarters. Its concession covers 440,000 square miles of desert, but its far flung operations are knit together and the movement of personnel and supplies takes place speedily by means of its fleet of airplanes. This fleet numbers 22 planes of various sizes and late design. In operation for something more than a year, they have proved their worth and are now an integral part of the company's transportation service.

Interior of Aramco plane used for carrying personnel and equipment.

Air conditioned trailer used for desert travel by Aramco geologists and surveyors. Trailers are equipped with sleeping quarters, kitchens, electric refrigerators and plumbing.

There are two DC-4's which shuttle back and forth between New York and Dhahran, a trip of about 36 hours' flying time, handling both passengers and cargo. One is called the Flying Camel and the other the Gazelle. There are also eight C-47 cargo planes, 11 single-engine ships and one small two-engine plane. There are nine pilots and ten co-pilots and scores of mechanics, servicemen and technical personnel to keep the fleet aloft. The pilots and co-pilots are Americans, as are most of the aviation employees. Operation of planes over Saudi Arabia presents some special aspects. The sand and the desert's high temperatures provide problems which make necessary unusual care and service for the equipment and constant alertness on the part of the pilots.

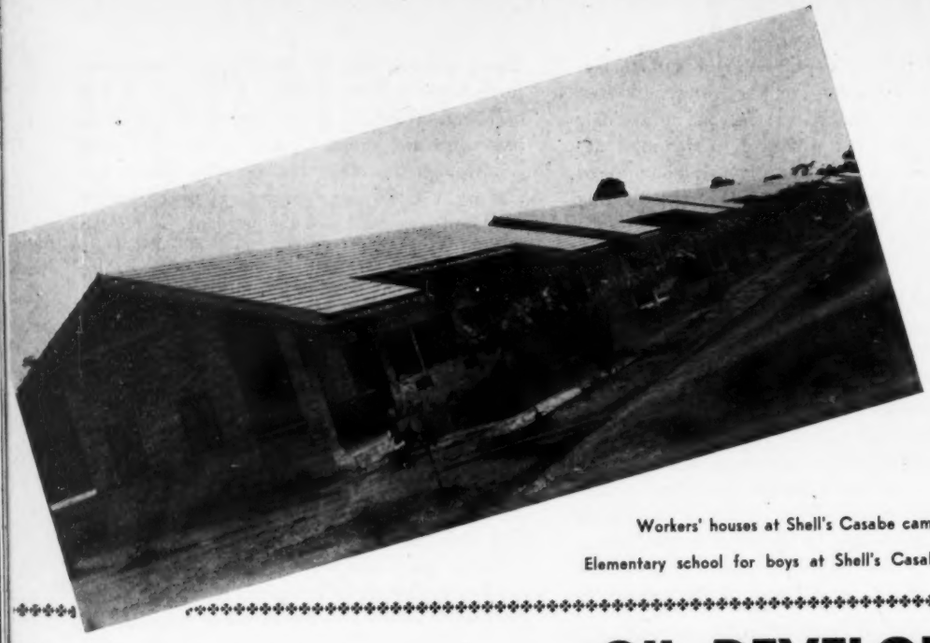
The maintenance crews work around the clock replacing parts which have been literally saturated with fine sand. The air is never free from particles of sand. The life of plane propellers is more than cut in half by the pumice-like sand, which constantly files away at them. The engines are replaced every 600 hours. It is necessary to replace the carburetors once a month; under normal conditions they would last a year. The steady heat causes parts of rubber to deteriorate rapidly.

Last year Aramco shipped by air more than 50 tons of emergency cargo, ranging from motor parts to medicine, from the United States to Dhahran. The two 6,000-foot runways at Dhahran easily accommodate the large planes. When additional air service is required, commercial airlines are used.

Not all the airfields are as elaborate as the one at Dhahran. Spotted over the desert at strategic locations Aramco maintains landing strips for the small planes which are used for pipeline patrol. The planes have helped prevent costly oil losses from leakage. Prior to the company's air patrol operation, Arab employees trekked across the sand for days checking the pipeline; now this operation takes only a matter of hours. It takes only a few minutes to report by radio any leak, and a few minutes more for another plane to take off with supplies and men for the repair job.

It is a day-in and day-out task to keep the small landing strips free from shifting sands. Snow fences keep back some of the sand, and bulldozers clear away any that does pile up.

Aramco's aircraft and flying personnel are under the control of the United States Civil Aeronautics Administration. The pilots and co-pilots are veteran airmen with long experience in ocean and desert flying. As rugged as the flying conditions are, the airmen, most of whom are married and have children, enjoy their work and surroundings. Their living quarters in Saudi Arabia are modern and attractive. The buildings are air-conditioned. There are good schools, a well-rounded medical service, movies, swimming pools and numerous other recreational facilities for the aviation crews as well as for the other Aramco employees.



Workers' houses at Shell's Casabe camp.

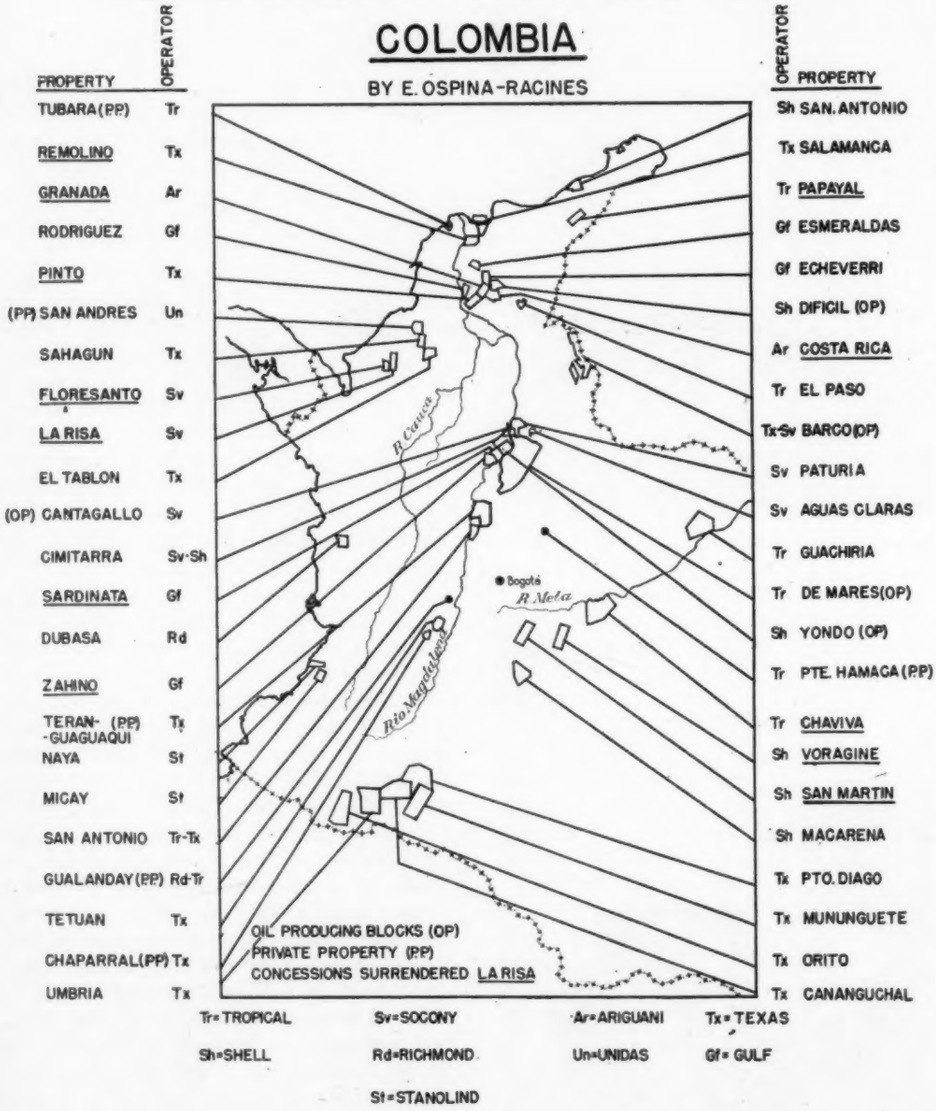
Elementary school for boys at Shell's Casabe camp.

OIL DEVELOPMENT IN COLOMBIA

1947 & 1948

WILDCAT & OIL PROPERTY INDEX MAP OF COLOMBIA

BY E. OSPINA-RACINES

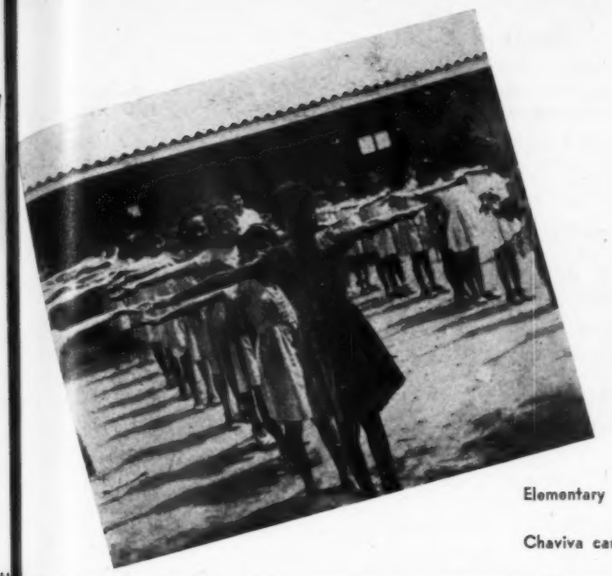


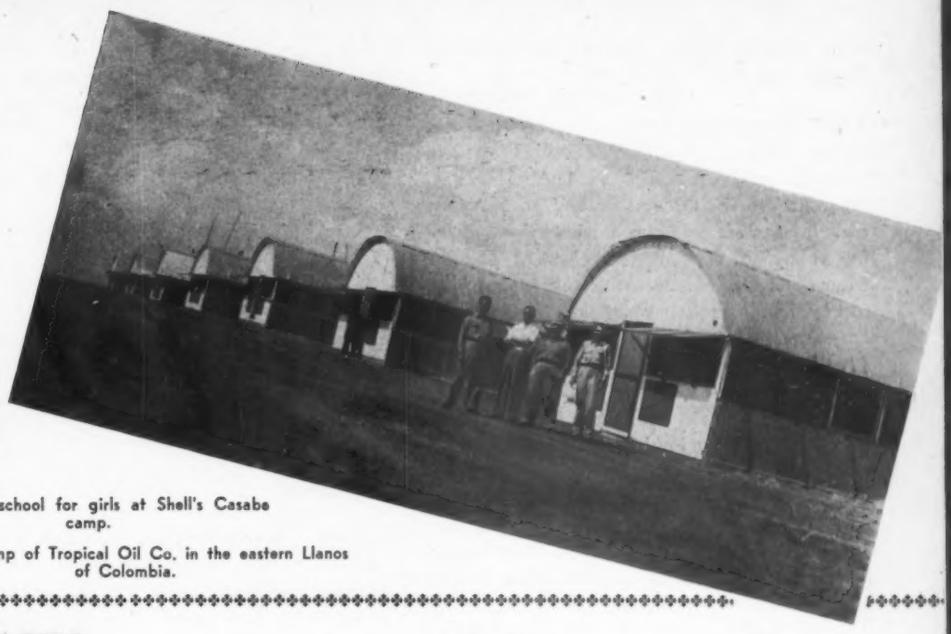
TO EXPLORE for oil in Colombia requires either a firm concession from the government or a lease of a private tract on which subsoil oil rights have been recognized as private. Similar to the situation in the United States and unlike the one in Venezuela, oil property rights in Colombia are vested either in the state or the surface owner. Wildcatting in Colombia, therefore, is a direct function of concession granting and private oil rights recognition. The overall concession granting and private oil property activity in Colombia since the oil law of 1931 is revealed in the data of Table 1 herewith.

It is observed that from 1931 to June 30, 1948, the government received 537 oil concession applications. Details by years since 1940 are shown. It is noted that only 66 concessions have been granted in Colombia during this period or 12.4 percent of those solicited. According to a recent statement by Minister of Petroleum Dr. Aragon-Quintero, the fate of the 537 bids has been thus: 207 are no longer valid; 44 are objects of private oil claims and in the courts; 120 are being studied by the Ministry; 66 are being revised; 66 have been granted as firm concessions and 34 are ready to be signed up.

The 31 million hectares of cumulative area represents about two-thirds of original prospective oil and and one-third overlapping of previous bids or concessions. Concession granting since 1940 has been to the extent of from one to seven concessions per year. Of the 66 grants made to date, it is noted that 46 have been surrendered, not having found oil in commercial quantities. Of the 20 concessions in force at this writing, only eight are the object of wildcat drilling. Since the others were granted recently, preparations are under way to wildcat on these twelve concessions.

Since 1931 the major operators have made some 850 leases. The net result has been ex-





Elementary school for girls at Shell's Casabe camp.

Chaviva camp of Tropical Oil Co. in the eastern Llanos of Colombia.

NEEDS NEW INCENTIVES

BY E. OSPINA RACINES

E. Ospina Racines

ploratory work on seven properties, two of which have been surrendered, while wildcatting is proceeding on the other five. In addition The Texas Company holds one lease and Shell three leases on properties on which oil rights have been recognized as private. Compared to concession results of 12.4 percent noted in Table 1, leases where wildcatting has taken place and those now held with a firm oil title represent about one percent of the leases made. The 537 concessions represent about 20 million hectares of original prospective oil area, whereas the 850 leases represent about one million hectares of oil land.

The delay in granting oil concessions in Colomvia has brought about the loss of much exploratory activity which otherwise would have taken place in the country. Of the six grants made during the first six months of 1948, five were filed as bids in 1944 and two in 1943. In contrast, the three commercial concessions under the oil law—Yondo, Cantagallo and Dificil—took from one to two years from filing to granting during 1947-1940 period. Whereas formerly it took one to two years to obtain a concession, it now takes from four to five years.

Prolonged delays are due to a number of causes: (1) The administrative process within the Ministry of studying bids and announcing them. The latter is referred to as being "accepted" by the Ministry. (2) Lawsuits arising from private oil claims. (3) Rigid interpretation of the oil law, particularly those sections dealing with certain areas such as "navigable rivers," "reserved zones," etc. (4) Non-concession granting policy invoked by some of the Ministers. (5) The innumerable oil bills drafted and submitted to Congress since 1942 and subsequently modified but left unapproved. (6) The numerous riders proposed and incorporated in the standard concession contracts, creating different terms for new concessions. Some of the causes have been remedied or eliminated. However, the principal delay currently is the rider situation pending an Act of Congress to pass a new oil law.

Delay in the process of recognizing private oil rights has also worked against a more widespread wildcatting activity. However, private oil claims and their recognition are not the serious problem today that they were a few years back. The operators have resorted to the expedient of leasing alleged claims and contracting the area as a national concession and subsequently submitting the claims to a court decision. In some leases the lessees have agreed to pay an aver-riding royalty if commercial oil is obtained, even if the claims are not upheld. The lessors grant the use of the surface in return.

Table 2 shows the number of properties, national and private, of firm acreage held by the operators. Of the nine private oil tracts, five are object of wildcatting, three by Tropical, one by Texas and one by Sinclair-Cities Service-Richfield. Four operators, Gulf, Phillips, Superior and Stanolind do not have any acreage with a firm title. These operators, however, have a number of concession bids filed as well as leases covering private oil lands. Stanolind, which recently established headquarters in Bogota, has negotiated some concessions just each of the Texas-Remolino block and in addition the prop-

Table 1

Colombia's Government Concession Activity 1940—June 30, 1948

Years:	1940	1941	1942	1943	1944	1945	1946	1947	Jan-June 1948
No. Bids Filed during the year	8	11	13	78	123	87	62	39	19
No. Bids accepted by Ministry during the year	6	11	6	21	58	20	7	66	31
As of December 31 Bid No. Filed ...	105	116	129	207	330	417	479	518	537
Cumulative area of bids filed—million hectares	4.1	4.4	5.1	9.6	18.1	22.5	26.2	30.0	31.0+
Concessions granted during the year .	7	1	1	5	6	5	7	7	6
Granted as of December 31	28	29	30	35	41	46	53	60	66
Surrendered—(Total end year)	7	9	12	15	18	22	29	40	46
In force—Total December 31	21	20	18	20	23	24	24	20	20

Table 1A

Overall Concession and Private Property Activity 1931—June 30, 1948

Concession Bids Filed to Date	Firm Concessions Granted	Private Properties Leased	Private Properties Wildcatted Upon	Total number of Properties	Surrendered Properties	In Force +-Active and Commercial
537	66	850	7	73	46 concessions 2 private	20 concessions 5 private
100%	12.4%	100%	0.8%	100%	66%	34%

erties indicated on the accompanying map on the Pacific coast, Naya and Micay.

Table 3 covers exploratory drilling activities and results obtained to date. Wildcatting started in Colombia in 1907 at Las Perdices, near Barranquilla where Tropical is now wildcatting, the No. 3 wildcat in the Tubara leasehold being known as West Perdices No. 1. The De Mares and Barco concessions were tested prior to 1931 and in addition some 23 private oil properties. Some 81 wildcats were drilled during 1907-1931, resulting in discovery of the Infantas field in 1916 and La Cira in 1926 in De Mares; the Rio de Oro field in northern part of the Barco concession in 1920, and Las Monas structure in the Middle-Magdalena Valley in 1926. Only Infantas and La Cira proved to be commercial. Since the oil law of 1931 it has been easier to obtain a firm concession than a firm private oil title, and in addition other factors have favored wildcatting in national properties. To date, as may be seen from the data of Table 3, 40 concessions and seven private oil properties have been the object of wild cat drilling since 1935 when the first well was spudded in a concession granted under the terms of the 1931 oil law. Of the 47 properties it will be noted that 34 were subsequently surrendered, not having found oil in commercial quantities. A total of 108 wildcats were completed in these blocks. This does not include the wells drilled in the three commercial concessions granted under the oil law, Yondó, Dificil and Cantagallo, where a total of 124 wells have been completed to date, and in De Mares and Barco grants where 1,375 and 228 wells have been drilled.

Deep drilling has been the trend in Colombia; the deepest wildcat was drilled by Richmond in the Caraballo concession to 11,805 feet. This compares with 4,610 feet which was the maximum depth drilled some 26 years ago. The operators have been assiduous and have been wildcatting in Colombia during the past 13 years. The net result of this activity has been the discovery of four fields since 1935 and in addition the wildcatting which has taken place in De Mares and Barco brings the total fields discovered to 13, with locations shown in Table 4.

The commercial results of the wildcatting and development drilling appear in Table 5. Colombia is currently producing 65,754 barrels daily, which is expected to increase some 3,000 barrels

Table 2

Acreage Holdings by Operators-Exploration as of June 30, 1948

Operator	Number of Properties Private	Number of Properties Concessions	Hectares of Holdings	Acreage H. x 2.47
Texas	2	9	1,322,536 h.	3,266,664 a.
Shell	3	5	296,393 h.	732,091 a.
Tropical	3	2	234,327 h.	578,788 a.
Socony	0	3	80,406 h.	198,603 a.
Sinclair	1	0	53,541 h.	132,246 a.
Richmond	0	1	25,466 h.	62,901 a.
Gulf	0	0	0	0
Phillips	0	0	0	0
Superior	0	0	0	0
Stanolind	0	0	0	0
Totals	9	20	2,012,686 h.	4,971,334 a.

NOTE: Texas private oil properties are: Teran-Guaguaquí of 127,205 h. and Chaparral of 14,276 h. Tropical leases are: Puente Hamaca of 143 h.; Tubará of 16,500 h.; Gualanday of 1,964 h. The latter is a joint interest property with Richmond. Shell holds three leases, thus: San Miguel of 595 h.; Bledonia of 497 h., and San Rafael of 502 h. Total area of private oil properties with firm title including the Sinclair-Cities Service-Richfield leasehold amounts to: 215,223 h. or 531,601 a. or about 10 per cent of the national oil land under contract.

Table 4

Oilfield Discoveries in Colombia 1916-1947

Concession and Operator		Fields discovered	Current Status	Year	Potential B/D Output
De Mares	Standard	Infantas	Producing	1916	8,180
		La Cira	Producing	1926	25,000
		Colorado	Producing	1945	320
		Galán	Producing	1945	71
Barco	Socony-Texas	Petrolea	Producing	1933	10,250
		Tibú	Producing	1940	10,900
		Rio de Oro	Shut in	1920	1,500
		Carbonera	Producing	1939	175
Yondó	Shell	Casabe	Producing	1941	15,000
Dificil	Shell	Dificil	Producer	1943	3,000
Cantagallo	Socony	Cantagallo	Producing	1941	1,000
Teran-Guaguaqui (private property)	Texas	Valásquez	Producer	1947	900
Las Monas	Gulf	Las Monas	Abandoned	1926	150

Gulf wildcat in Sardinata concession, middle-Magdalena valley area.

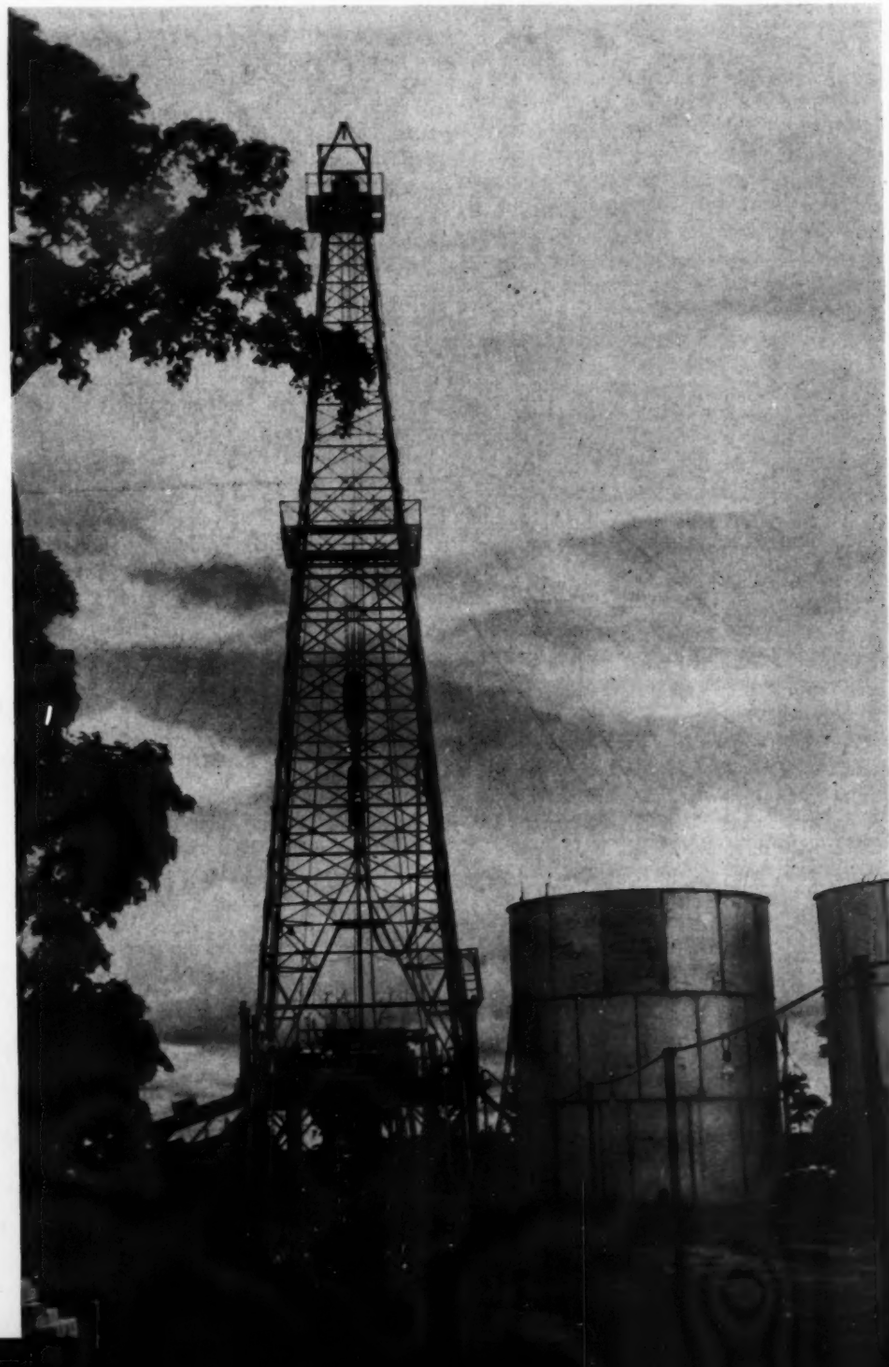


Table 3

Wildcat and Development Drilling In Colombia 1907—June 30, 1948—Commercial Results

Operator	Tropical	Ariguani	Shell	Texas	Richmond	Socony	Gulf	Sinclair	Others	Total	Prior to 1931	Total Colombia
Tracts prospected												
Concessions	8	2	11	5	5	7	2	0	0	40	2	42
Private	2½	0	0	1	1	½	0	1	1	7	23	30
Wildcats-to-date:												
Completed	14	3	29	9	20	26	5	1	1	108	81	189
Drilling	3½	0	½	3	½	½	0	1	0	9	0	9
Wells in commercial concessions to date												
1. Yondó	—	—	88	—	—	—	—	—	—	88	—	88
2. Dificil	—	—	23	—	—	—	—	—	—	23	—	23
3. Cantagallo	—	—	—	—	—	13	—	—	—	13	—	13
4. De Mares	1375	—	—	—	—	—	—	—	—	1375	—	1375
5. Barco	—	—	—	228	—	—	—	—	—	228	—	228
Properties surrendered												
Concessions	6	2	9	2	5	6	2	0	0	32	0	32
Private	0	0	0	0	1	0	0	0	1	2	23	25
Active wildcats properties	3½	0	½	3	½	½	0	1	0	9	—	9
Deepest well-Ft	9,502'	10,609'	10,929'	11,590'	11,805'	10,876'	8,250'	7,365'	640'	—	4,610'	11,805'
Location of No. 7	Cimitarra	Costarica	S. Juan	Remolino	Caraballo	Floresanto	Sardinata	San Andres	Primavera	—	Perdices	Caraballo
Year Wildcatting started	1935	1945	1938	1945	1941	1937	1946	1947	1937	—	1907	1907
Years lapsed to date	13 yrs.	3 yrs.	10 yrs.	3 yrs.	7 yrs.	11 yrs.	2 yrs.	1 yr.	1 yr.	—		40+
Fields discovered	4	0	2	3	0	1	0	0	0	10	3	13
	Infantas La Cira Colorado Galán		Dificil Casabe	Velasquez Petrolea (Barco) Tibu (Barco) Carbonera (Barco)		Cantagallo					Infantas La Cira Las Monas Rio de Oro	

NOTE: In tracts prospected and wildcat data the ½ indicates a joint property or wildcat. Barco is a joint Socony-Texas property.

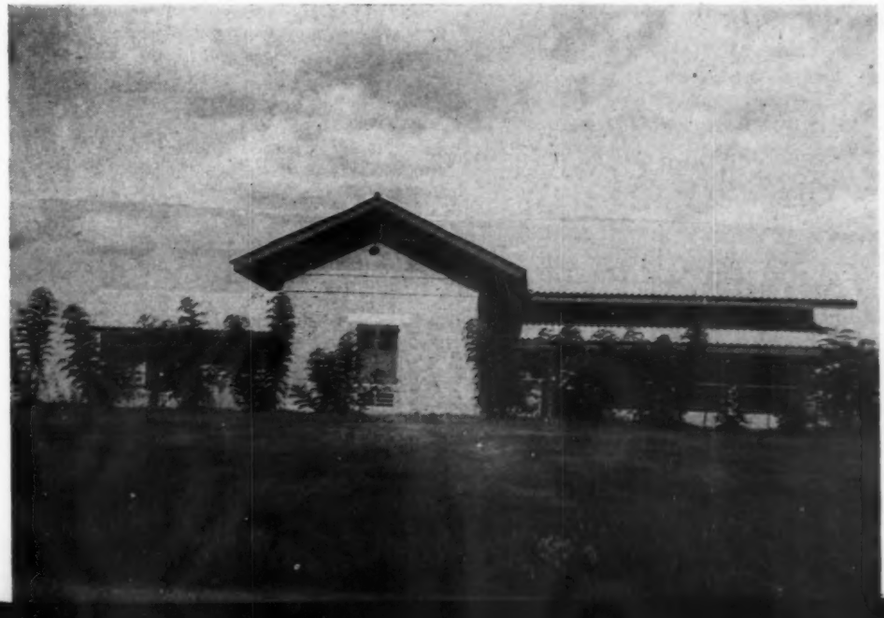
daily with the start of pipeline shipments from the Dificil field. Colombia's oil output in 1940, eight years ago, averaged 70,000 barrels per day, so that the net result of the wildcatting and drilling during the past eight years has been in effect to compensate for the waning oil output of the La Cira and Infantas fields in De Mares and the Petrolea field in the Barco.

The general crude oil price increase experienced in the United States is reflected in f.o.b. prices for Colombian crude. These price increases have enabled the operators to pay additional taxes, higher salaries and wages and living allowances and to replace equipment at current prices.

Recent data made public by the management of the Andian 335 mile common carrier, which transports De Mares, Yondó and Cantagallo crude and will carry that of the Dificil field, serves as an index as to how increased operating costs, particularly salaries, wages and social benefits, have curtailed both government income and the operator's yield on the investment.

For 1944 Andian operations show a 10.68 percent yield on the capital assets, the government obtaining a revenue of 7.27 cents per barrel transported. Salaries and wages plus social benefits to labor in 1944 averaged 6.19 cents per barrel of oil transported. Similar data for 1947 reveals a yield of 5.01 percent on the capital assets as the net profit for Andian, government payments of 5.18 cents per barrel transported, and payments to labor of 13.83 cents per barrel transported. This reveals a drop of 53 percent in the net income of Andian, a drop of 29 percent in government income, while on the other hand the cost of labor increased 123 percent during the four years.

Staff club at Shell's Dificil camp.



Barco concession, jointly operated by Socony and Texas, reported for 1944 a yield on its capital assets of 0.19 percent and total payments to the government in royalties, income taxes, customs and miscellaneous levies of 20 cents per barrel of oil exploited and 21.20 cents per barrel in total wages and salaries. For 1946 the yield on the capital assets amounted to 1.88 percent; payments to the government totaled 21.24 cents, whereas wages and salaries increased to 35.51 cents per barrel of oil exploited. The latter outlay increased 67 per cent during the two-year period.

A report on Tropical operations, which includes exploration, production, refining and distribution, reveals a drop from 11.7 percent to 1.44 percent in the yield on its capital assets from 1944 to 1946. Payments to the government per barrel of oil exploited dropped from 28.05 cents per barrel to 20.90 cents. On the other hand total wages and salaries in 1944 averaged 25.31 cents, and in 1946 these averaged 62.46 cents per barrel of oil exploited, an increase of 147 percent over the 1944 average for the latter costs.

Despite a crude oil price increase of 93.5 per cent for Colombian crude during the 18 months, July 1946 to December 1947, net profits of the producing companies and likewise government income per barrel of oil exploited have suffered an appreciable drop.

The oil industry has been making heavy dollar investments in Colombia, and today it is the country's second most important source of dollar exchange. The data in Table 5 shows that during the four years 1944-1947 the oil industry averaged 22.3 percent in dollar exchange as compared to the dollar proceeds from the sale of coffee, Colombia's foremost crop. In 1945 when

Seismograph party on a tributary of the Magdalena river in a Gulf concession.

the coffee price was under a ceiling control, oil dollars amounted to 30.4 percent of the coffee sales. In addition to the dollar exchange sold to the Banco de la República, the central bank of issue, the oil industry imported during the years 1945-1947 $40,200,000 in oil equipment, machinery and goods, making total capital imports amount to $142,560,755 during this period, whereas oil exports amounted only to $83,413,-110. Without the oil dollar imports and if the oil industry were to require dollar exchange for its capital investments, Colombia would experience a very severe dollar deficit. The role of oil dollars in this respect compared to coffee dollars is revealed in the data in Table 6.

The data presented herewith represents the current status of the Colombian oil industry after some forty years of effort to find and develop commercial oil in Colombia. From a production

(Continued on page 96)

Table 5

Data on the Five Commercial Concessions in Colombia

Operator identification: In United States / In Colombia	Standard Tropical	(Socony-Texas) Colpet	Shell Condor	Shell Estrella	Socony Valmag	Total Colombia
Name of concession	De Mares	Barco	Yondó	Dificil	Cantagallo	5
Year granted and term	1921—30 years	1931—50 years	1945—30 years	1948—30 years	1947—30 years	
Wells drilled in producing fields + wildcats	1375	228	88	23	13	1727
Year wildcatting started	1916	1933	1941	1943	1941	
Pipeline shipments started	July, 1926	October 1939	June 1945	August 1948	December 1947	
Producing fields and API of oil	La Cira 25.0° Infantas 26.5° Galán 19.3° Colorado 38.0°	Petrolea 46° Tibú 33°	Casabe 20.1°—24.5°	Dificil 42.2°—70.4°	Cantagallo 20°	
Average daily production 1947	34,104 B/D	21,198 B/D	13,095 B/D	3,000 B/D	987 B/D	68,440 B/D
" " " May 1948	26,773 B/D	22,482 B/D	15,413 B/D	(potential) 1,	1,082 B/D	65,754 B/D
Cumulative production to date May 31, 1948	386,140,941	39,311,228	11,852,725	—	294,034	437,598,928 B.
Proved acreage	18,711 a.	13,120 a.	3,750 a.	1,900 a.	500 a.	
Weighted Average price fob during 1947 per barrel	$1.89	$2.06	$1.65	$—	$2.10	
current fob price	$2.57	$3.00	$2.35	—	$2.35	
Pipeline distances: tidewater-kilometers	540 k.	421 k.	522 k.	218 k.	480 k.	
miles	335 mi.	261 mi.	324 mi.	135 mi.	298 mi.	

DEVELOPMENT OF WORLD OIL RESOURCES

By J. E. Brantly*

DISTRIBUTION of the earth's natural resources was determined by Nature following physical laws of which man himself had little cognizance until most recent times. Control of these resources, resulting from possession of certain surface areas, has been decided by mankind acting in more or less completely organized and often conflicting groups. It has been influenced by racial characteristics, tribal habits and to some extent by the ambitions and achievements of individual leaders. These have found expression in mass movements of population, in exploration of unknown areas and in the development of aptitudes for certain forms of enterprise by particular groups.

Since war has been the determining factor in fixing national boundaries, it is logical that these often follow the lines of protective barriers such as mountain ranges or coastal lines. Surface attractions such as the existence of great fertile areas sometimes led to expansion beyond such natural limits, but the buried treasures of the earth had little part in stimulating ambitions for ownership because, with few exceptions, little or nothing was known of their potential value and usefulness. It is true that the lure of gold led the Spanish conquistadores to overrun and annex a large part of the western hemisphere, but trade was the magnet that led British voyagers around the world in the fifteenth and sixteenth centuries, while religious or political consideration influenced the settlement of many areas.

Under these conditions it is not surprising that there is an unequal distribution of mineral resources among nations. What is surprising is that so many do possess such resources equal to or exceeding their own requirements. The majority of useful ores of metals occur in ancient rocks or in later sedimentary materials that have been affected by severe metamorphism due to folding and faulting and by contact with intruded hot igneous rock. Iron and aluminum ores and those of a few other metals are found in these old and metamorphosed rocks, but also in relatively undisturbed sedimentary rocks. Coal and petroleum are found entirely in sedimentary formations, except that in rare instances oil is found in broken or porous igneous or crystalline rocks contiguous to relatively undisturbed sedimentary formations. Nearly all nations have considerable areas of marine sedimentary rocks within their boundaries, regardless of how these boundaries were established. Petroleum deposits are usually found in marine strata but also in other types of formations in contact with or in proximity to marine beds.

In North America, for example, the greatest areas and thicknesses of marine strata occur within the limits of the great inland seas or marine basins which from time to time covered vast sections of the mountain and plains area reaching from the Arctic Ocean to the Gulf of Mexico. A Paleozoic sea extended eastward to the Appalachian Mountains of the old Archean Landshield which lies, generally, a short distance inland from and parallel to the Atlantic coastline. Other basins are found around the Gulf of Mexico and along the Pacific Coast and in the basin of the St. Lawrence River. Continental shelf deposits are found along the eastern seaboard. Other and smaller embayment areas are found in Mexico and Central America. In fact, practically all of the continent with the exception of the Appalachian Piedmont crystalline area of the eastern United States and southeastern Canada and the landshields of eastern and central Canada have been marine areas, during or since Paleozoic times.

On the North American continent boundaries between Canada and the United States and the United States and Mexico were established along the natural barriers of the Great Lakes and the Rio Grande River on their easterly parts, with arbitrary extensions along virtually direct lines westerly to the Pacific. These east-west boundaries gave to Canada the northern half of the great mid-continental marine basin sediments. The United States received its share extending from Canada through the several eastern, Rocky Mountain and Great Plains states and Texas to Mexico and the Gulf. Mexico received a share delimited on the north by the Rio Grande and on the west and east by the Cordillera Occidental and the Gulf of Mexico respectively. These nations likewise received lesser areas of sedimentary rocks that are now entirely within their respective boundaries. Thus, by accident rather than by design, each nation has great areas of sedimentary rocks in which petroleum may and does occur, although their boundaries were selected by arbitration succeeding wars and without regard to any natural resources other than land and water courses.

The Western Hemisphere was divided in 1494 by a treaty dictated by the Pope which gave all the lands east of a north-south line 300 leagues west of the Cape Verde Islands (about Long. 48° W.) through the mouth of the Amazon River to Portugal, while all the lands west of that imaginary line were assigned to Spain. This division was not followed in detail, for much more of eastern South America is now Brazilian territory, of basic Portouguese culture, and the western part is divided among nations of Spanish-American culture. The boundaries between Portuguese and Spanish territory as well as between the Spanish culture provinces or nations themselves, almost without exception were selected and described along natural barriers Thus, the principal boundary limits of Venezuela passed southward along the crests of the mountain ranges of the Central Andean Lineament, across the unsettled plains and into the wild country of the headwater streams of the Orinoco River, thence easternly along the Meta River and across the jungles to the Guyanan Mountains, northerly along their crests and across the Coastal Plain to the Atlantic Ocean. These boundaries include the greater part of the Maracaibo Basin and the monoclinal or synclinal sediments between the eastern lineament of the Andes Mountains and the Orinoco River. These two regions are rich in oil.

The boundary between Chile and Argentina was drawn along the divide which separates the Atlantic and Pacific watersheds. Argentina acquired that great area of principally sedimentary rocks lying between the Andes and the Atlantic, while Chile through a boundary line at some variance with the drainage divide, turning eastward and then southward at the southern end of the continent, acquired sedimentary areas on both the mainland and on the Island of Tierra del Fuego. Boundaries of the other nations of South America were similarly chosen. The lands and resources within the boundaries of the nations of South America were thus determined by topography, drainage and rain forests rather than otherwise. It is doubtless fortunate that they were so described without more than a sketchy knowledge of the resources of the included lands, except gold and silver.

The sedimentary areas of South America were derived from two principal pre-Paleozoic land areas which included the Guyanan Shield of pre-Paleozoic rocks between the Orinoco and Amazon Rivers and the great Brazilian Landshield of comparable or even greater areal extent including the preponderant parts of central and eastern Brazil. These land areas furnished the source material for the sediments of the inland or channel sea between the two shields and for the sediments that were deposited on the continental shelf which rimmed the land areas as they originally existed and were later developed on the north, west and south, and to a lesser degree, on the east. Through successive periods of folding and other mountain-forming phenomena the Andes Mountain system was developed along the northern and western continental boundaries. Within the several lineaments of this Andes Mountain system, there are isolated low and late basin areas such as the Maracaibo and Magdalena Basins, but the great area of relatively undisturbed sediments occurs as a narrow synclinal basin extending from Trinidad to and including the Island of Tierra del Fuego and lying between the old landshields and the Andean Cordillera and sometimes designated as the sub-Andean Trough. This basin is broken by areas of crystalline rocks. The Amazon and Marañhão Basins are likewise sedimentary areas.

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Several tons of feathers, among other things, were used in an effort to kill the Atlantic No. 3, spectacular wild well in the Leduc field in Alberta, Canada.

In northcentral Europe there is a large sedimentary basin including parts of Germany, Denmark, Holland, the southern tip of Sweden, the North Sea region and part of northeastern England. Lesser basins occur in northern France, adjacent to the Pyrenees in both France and Spain, in Central Europe and in northern and eastern Italy. The Black Sea and Caspian Basins involve northern Turkey, southern and eastern Russia, the southern Balkan states, northern Persia and adjacent parts of Siberia and Afghanistan. Still another great area of sedimentary rocks reaches through central and northern Siberia and on to northern Alaska.

The basin surrounding the Fertile Crescent of Biblical literature includes western Persia (Iran), Iraq, southern Turkey, Syria and the other states of Asia Minor, eastern Arabia and adjacent states and northern Egypt. Other areas of sedimentary rocks occur in Africa and Asia especially including the major parts or all of the continental shelf islands of Sumatra, Java, Borneo and lesser islands. In reality this great region of the western islands of the East Indies and the Philippines are a part of the Asiatic continental mass, which during the more extensive ice ages of recent times were connected to the mainland by the land beneath the shallow seas of this great region. Australia, New Guinea and nearby islands, together with the lands surrounding them below the shallow seas, constitute another great continental mass with more or less extensive areas of sedimentary rocks.

The boundaries of the political subdivisions of old world continents were chosen in most cases hundreds or even thousands of years ago. They were selected or marked along natural barriers without regard to resources of the region other than arable land and water. It is only in recent years and particularly subsequent to the first and second world wars that the fixation of political boundaries has taken natural resources into important consideration.

Any area having considerable thicknesses of marine sedimentary formations offers possibilities for the production of oil in substantial quantities. Recognition of this fact has revolutionized earlier ideas as to the probable extent of the world's petroleum resources. It is fortunate that this is so in view of the tremendous growth in the demand for petroleum products which makes it inevitable that the lands of all states or nations in which these sedimentary areas occur eventually will be explored and tested for oil. The majority of these areas of marine sediments may be expected to produce oil in the future.

Petroleum and its products have been in wide use for little more than two generations, and yet a substantial part of the previously known and assumed oil reserves of the world has been produced and consumed. Still oil is of growing importance to all nations and to all peoples of the world, and none can develop culturally or economically, by modern standards, without an adequate supply being made available for its use at reasonable cost.

With the growing dependence of all nations on transportation and power facilities for cultural and economic development, no nation with the possible exception of a few of those of small area and dense population can afford to purchase from outside sources all of the petroleum products that it can and should use. Therefore, an entirely adequate petroleum supply depends upon its recovery largely if not wholly from national territory. The United States of America consumes approximately six million barrels of petroleum daily, worth at the point of manufacture or of refining an average of three dollars or more per barrel. This is a total sum of approximately $18,000,000 daily or roughly $6,000,000,000 annually. The economy of the nation could not afford such an expenditure of resources and labor in exchange for any single commodity. Nor could the culture and economy of the country have developed as they now exist had it been necessary to purchase abroad all the petroleum needed or used. What is true of this country is equally true of others.

While there are even greater variations in the development of oil deposits than in their distribution, all nations having producible petroleum within their borders need to have that resource developed in order that fuels and lubricants may be made available to their nationals at minimum cost and in order that they may obtain revenue for the purchase of commodities which they do not possess. Those nations which do not have sufficient petroleum within their boundaries have the moral right to have additional quantities made available for their use.

As demands have grown or deposits in certain producing districts have approached depletion, development has been extended to areas where such undertakings are difficult and financially hazardous, and experienced technicians have gone into regions where indications were favorable and development was lacking. Thus were mines opened, factories built, railroads constructed, ports developed, sound economies established, populations increased by immigration, social and political cultures reinforced, developed or established. In this manner was the United States of America built.

It is extremely difficult for any nation to develop a resource or build a plant or engage in an industry in which its people has had no experience without assistance from the peoples of other nations who have had such experience. People who have had little or no experience in the use of capital in industries and the development of natural resources cannot readily be persuaded to assign their funds to use in such hazardous undertakings. There is little venture capital except in those countries long experienced in undertakings with a high risk hazard.

As the people of a nation become proficient in a useful, successful and profitable industry, there is a tendency during normal times to develop an excess of personnel prepared for or experienced in that industry. If the industry is profitable excess capital eventually is generated that cannot find sufficient outlets for use within its own or allied industries. At the same time there may be, and frequently is, a demand for the products of the industry both domestic and for export that increases more rapidly than the resource on which the industry is based can be discovered, developed and brought into production in that country. Such conditions have obtained at various times

amongst the very few highly industrialized nations. Then it is that capital, and the men to use the capital, or experienced personnel, seek out these resources in foreign lands which permit their development by others than their own nationals.

The motives of the people and venture capital of the highly industrialized nations in exploring for and developing the resources of other countries are not altruistic, though they generally serve the same end. It is their purpose to develop the resources for a profit to themselves, and this incentive is required by human nature, but in doing so they create a means through which substantial numbers of the people of the host country may earn a livelihood. They make the resource and its product available to the people of the country at reasonable cost and usually produce a surplus of the material or products that may be used by the nation in exchange for other materials or products that it does not possess or produce. Many examples of resources and raw materials and their products may be cited; for example, copper, iron, tin, sugar, gold, silver, lead, diamonds, petroleum and many others. The development of many of these resources has been the basis for the building of a sound economy in the producing country, for the creation of prosperity, for the building of industry and for the building of nations themselves. There is no nation that has developed a sound industrial economy and high standard of living for its people without the aid of the people and capital of another nation previously experienced in the industry. There had to be a beginning, of course, and that beginning extended over a period of many years and was based on the development of the loom and use of coal for industrial power.

It is the duty and it is to the benefit of the older industrial nations, through men and materials and capital, to aid in the development of the resources and industry in countries that have not been so developed. This serves usefully the people of the country being developed and the commerce and industry of the country that is the source of the technical personnel and capital. Most important of all, it leads toward the eventual prosperity of the world and should promote its peace. A people with low average incomes cannot as a whole enjoy more than a very low standard of living and culture. Nor are they buyers of the manufactured products by which high standards of living are made possible.

The principal incentive for the group or nation to develop or to permit the development of a given resource is the need of the resource itself, or its products, and the other benefits to be derived therefrom. The principal incentives for the individual are a means of livelihood, a profit or, simply, accomplishment.

It is the inalienable right and privilege of a sovereign nation represented by its government to choose the policy that it will pursue. If it elects to develop its petroleum resources through governmental agencies, it is within its option to do so. On the other hand, if the nation elects to develop its resources through the assistance of individuals or corporations, either its own nationals or others, it must promulgate laws that will provide an incentive to undertake the risks of exploration and development.

A consideration that has induced certain nations to undertake development of their petroleum resources through the medium of their governments is that in this way the government has at all times complete and sole control of all the oil produced and of the handling of its reserves.

By the use of trained and experienced personnel, such exploration and development, theoretically at least, may be carried out as effectively and economically as could corporate operations or those carried on by individuals. In effecting such an operating organization for exploration, producing and refining and for normal efficiency, the organization must be established in a more or less autonomous position that is not subject to the vicissitudes of political control. It should function as nearly as practicable as would a normal private enterprise, and it should be operated for profit as though it were a commercial venture. Only in this manner can the most efficient operation be realized.

A people may decree that all of the natural resources of the nation included in the subsoil or on the surface other than the surface soil itself are the property of the nation, but that the development, production and processing of these resources are the right and privilege of the individual separately or as they may be legally organized in corporate bodies. This right of development may be extended to other nationals in order that capital may be enlisted in the search for petroleum or other resources and that men of high technical training may be engaged for the task. The remaining alternative is that foreign capital may be allowed to explore for and develop petroleum resources.

Owners of the subsoil and the resources it contains, whether individuals or the nation itself, are of course entitled to their just proportion of the oil produced or its monetary equivalent. They have a corresponding duty to provide fair and reasonable laws governing the operations and activities of the operating organization. At the same time and in return for the hazards taken and for the service to the nation in developing its resources, the operator has the right to expect and receive a fair proportion of the oil produced and the opportunity to earn a reasonable profit on his investment. The laws promulgated should not restrict the operations and activities of the developing organization in such a manner as to impair the efficiency and effectiveness of the operations.

Exploring and drilling for oil in virgin territory even with favorable aspects of the geology is a costly and financially hazardous undertaking. It requires geologists, geophysicists, well men, production men and engineers long experienced in such matters in order that a venture may be prosecuted to a successful conclusion, assuming the presence of oil in commercially producible quantities. Capital is required in sufficient amounts to assure prosecution of the exploration and development to that phase where a commercially successful development is under way.

The organization's resources should be such that an unsuccessful venture is not of vital importance to its existence, but under such circumstances it can seek other prospective developments in other areas or countries. Any organization of limited financial resources or limited experience, or limited in areas in which it might seek oil production, labors under a substantial disadvantage compared to an organization that is more liberally provided with capital, income and experienced personnel and which has a greater expanse of territory or countries or continents on

Fishing tools in the Albanian oil fields. Shortage of modern tools in some European areas still is acute so that operators must improvise their own tools as best they can.

which to seek producing properties. That is to say, an organization sufficiently supplied with material resources may seek and expect to recoup its losses in unsuccessful exploration in one territory by successful prospecting and development in other territory, in another country or in another part of the world. An organization that is limited in capital resources or restricted to one area in which it may operate does not have as good prospects for successful and profitable development as has the organization that does not labor under such restrictions.

When a nation arrives at the conclusion that it can best secure the development of its petroleum resources through private initiative and organizations, it must decide upon that division of the oil recovered and the profit earned that will assure the nation a fair proportionate return from the exploitation of its resource. At the same time the laws and regulations must be sufficiently liberal in their provisions so that they will give the operator the needed incentive and will not defeat the very purpose of obtaining development of the resource for which the laws were designed

The petroleum law may be built around either of two basic principles: First, it may provide for the granting of concessions to operators who will pay to the government a percentage of the gross income of the oil produced or will assign to the government a percentage of the gross production recovered, at the election of the government. Second, the government may retain full title to all petroleum that may occur on a given property and make an agreement with an operating company, paying to that operating company a percentage of the oil found and produced by it. In the first type the company receives title to such oil and gas that may occur in the subsoil, with the privilege of exploration and development as may be required. In the second, the government retains title to all of its resources. The operator agrees to explore and develop the area under contract to him at his own expense and to be paid therefor in oil.

These two types of laws may finally arrive at identical ends, ownership and payment differences being of a technical rather than practical nature. The second, however, retaining in the nation title to all resources may be politically more expedient.

After the basic principle of the law has been selected, there are three major conditions to be written into the law. They are: first the division of the petroleum either in kind or in income between the nation and the operator; second, the amount and distribution of the lands on which concessions or contracts are to be executed with the operator; and, third, the amount and rate of exploration and development required of the operator by the government.

There is no proper and fair division of the oil or the benefits from it between the nation and the operator that is applicable generally to all areas and to all conditions. Despite this obvious fact most petroleum laws are based on the fallacy of the equity of uniform royalties. In finality an operator is willing to receive as his ultimate share that proportion of the final profit from the venture that will justify the undertaking. The operator takes into account and the law should take into account the conditions which control the development of the property and the production to be obtained per unit of expenditure or operating cost.

For simplicity, the amount of the gross oil as such or the income from the gross oil accruing to the benefit of the government will be referred to here as "royalty," regardless of whether the law is written on a contract or a concession basis. Even though the operator's share, insofar as obtaining development is concerned, is a more vital part of the agreement, it will be simpler to discuss the royalty with the understanding that after deducting the royalty from the gross production or the gross income, as the case may be, the remaining oil or income accrues to the benefit of the operator.

It would be quite possible, theoretically at least, to calculate a royalty scale that would provide a fair royalty to the government under the varying conditions which control exploration and development, even though the variations in these conditions are almost limitless in their number and effect. A few of them are distance of the areas to be prospected from areas in which the oil and its products are to be marketed; distance from the properties to pipeline or deep water transportation facilities; operating conditions in the areas to be developed such as desert country or rain forests, hot or cold country; the amount of exploratory work that has to be undertaken before oil is found; the amount of development work that has to be done before oil can be marketed; the productivity of the producing formations to be developed or the amount of production to be obtained per well or per unit area; the rate of production per well or per unit area; the problems of production; the drilling costs, including the depths of the wells. Many other conditions could be added, but these are sufficient to indicate the vast complexity of the problem. It would be entirely possible to draw curves including all of these conditions that would permit the calculation of the proper royalty on a given property having once determined the basic value, but it would be utterly impractical to do so. It would appear then that a basic royalty should be established throughout a country where the conditions are more or less similar or for each region of a country where conditions vary substantially.

In basic principle the royalty should be the minimum that reasonably can be expected by or is acceptable to the owning nation. The purpose of this low royalty is to create an incentive that will induce operators to seek concessions or contracts to explore and develop the petroleum resources of the country.

In addition to these royalty provisions of the law, there should be clauses providing for division with the government of the net profit accruing to the operation. This percentage of division of profit should be graduated, based on the ratio of net income to gross development costs and operating expense. That is to say, a property that requires more effort and more capital and expense for the production of a given amount of oil should surrender a smaller proportionate part of its income than the property which requires less effort and a smaller amount of capital and expense for the development of its oil. As a further example, a development of a field or an area that can barely be developed within sound economic limits should surrender to the government a lower proportion of its net profits than an area or field in which drilling costs, production costs and capital requirements are low. Because of accounting difficulties, it would be impractical to create too narrow subdivisions, but the basic principle can be established and adhered to, as in the usual income tax law, to the advantage of both the host nation and the operator.

Only by the establishment of a minimum royalty and an equitable graduated tax on net income can the inequalities of a fixed overall high royalty be eliminated and marginal deposits or reserves brought into useful production. Further, the governing law or the contract or concession itself should provide fixed terms and conditions that include total royalties, taxes and other imposts and requirements that would not be altered throughout the life of the agreement, except as provided in the law, without the consent of the operator.

The amount and distribution of the land to be assigned under each concession or contract depends upon the amount of territory having possibilities of commercial production and that minimum area of lands for exploration that would justify the interest and undertaking by the prospective operator. As a matter of principle it would generally be advantageous to the host nation to allot lands to several operators. The spirit of competition, the diversity of ideas and theories concerning the occurrence of oil, the diversity of oil finding methods and technique and the variety of operating practices will all be helpful to the primary objective, which is the recovery of maximum oil at minimum cost. In the event that the prospective area or areas are small, it may not be practical to so diversify.

The area of the minimum exploration concession or contract depends entirely upon the conditions which obtain and are to be encountered. In one case as little as five hundred hectares may be sufficient, while under other conditions five hundred thousand hectares or more may be necessary to permit the development of a logical, practical and economical exploration and development program. One country has established ten thousand hectares as its standard unit concession, while each operator is limited to a maximum number of concessions.

It has further been common practice in some countries to grant an exploration concession of a given size, for example, ten thousand hectares. The operator is then required within a given period of time to select one-half of the concession for development, returning the remaining half to the government of the host nation. The rights so re-acquired by the government may then be

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reassigned by sale or otherwise to the original or to a different operator. This practice was developed and written into the law as a means of assuring the government its fair share of the oil and the income or profit derived from it.

Though these practices were developed as a protection to the government, it is possible that the objective is not always realized, and certainly it frequently works an uncontrollable and unnecessary hardship on the operating company.

Under such a petroleum law, carrying minimum royalty provisions and division of net income or an income tax calculated in accordance with a properly and carefully determined graduated scale, the nation would be assured of its fair proportion of all the benefits derived from the development of the producing properties, and the operator would be freed of undue and unnecessary hardships and could generally conduct a more rational, orderly and efficient program. Such operations would inure to the benefit of the proprietor nation.

The final major point or condition to be determined is that governing the exploration and development program insofar as time is concerned. Here a balance must be sought between the requirements of the government for oil and income and the time requirements of the operator for thorough exploration and efficient development. Here again the natural conditions will control to a considerable extent. If the country is open, accessible and has easily-workable geology, a minimum time for exploration will be required. As it decreases in accessibility and as the geology becomes more difficult, an increased exploration period is essential. Development should come in an orderly manner, determined by the requirements for the oil and economics. It is difficult to fix such matters by law because of rapidly changing conditions. Therefore, broad terms and conditions only are practical, and adjustments and changes that are necessary to meet new conditions should be agreed upon and caused to function by both the host nation and the operator within the spirit and basic principles of the original law or contract.

Actions by the host nation, under its powers to make laws or issue decrees that alter the terms and conditions under which either national or foreign operators accepted the responsibility of exploring for and developing oil production tend to defeat the basic purpose for which the laws were designed. At the same time abuse by the operator of technicalities and liberal privileges under the basic laws are wrong and tend to force the government of the host nation to exercise its sovereign authority in correcting such abuses.

In summary of the foregoing discussion:

All sedimentary basins on the several continents offer possibilities for usefully producible oil. The majority of the nations, states and dependencies on these various continents include sedimentary basins within their boundaries. All of these areas eventually will be explored or drilled for oil, and the majority of them reasonably may be expected to produce.

There are no nations, with the exception of two or three highly industrailized small countries, which can afford to purchase abroad all the petroleum products they require for their desired cultural and economic development. Therefore, in order that they may attain and maintain that standard of living for their people which petroleum products can promote, the sedimentary areas of possible production must be explored and developed for the primary benefit of the owning nation.

Thomas M. O'Malley

Heads African Magnetometer Survey

Thomas M. O'Malley has been named project engineer by Aero Service Corp. for its mapping-magnetometer survey of Portuguese East Africa for the Mozambique-Gulf Oil Co., a wholly owned subsidiary of Gulf Oil Corp. He will direct the operations of its 15-man staff of pilots, photographers, electronic engineers and technicians who will perform the survey of the oil company's large concession area. Mr. O'Malley has been associated with Aero Service Corp. since 1936 except during the war. His experience with the company includes extensive work in its photo laboratories and drafting department, as well as with the Brock process and other photogrammetric instruments employed by the company. He has headed the data reduction staff of the company's magnetometer division for some time.

A concession area of 45,000 square miles has been granted to Mozambique-Gulf for exploration and development. The area includes both wooded and savana country. Existing African maps are inadequate, so precise aerial maps will be made of the concession area by Aero Service. These photo maps will be used first to guide the plane in the airborne magnetometer survey of the area; then the maps will be used later for the oil company's development planning.

About six to twelve months will be required to complete the aerial mapping and magnetometer survey. A staff of 15 men—pilots, mechanics, radio operators, photographers, electronic engineers and mapping experts—makes up the Aero Service survey party.

This survey is one of many aerial mapping or magnetometer surveys performed by the Philadelphia company in Alaska, Canada, Central and South America and other foreign areas. Aero Service recently completed the first large-scale airborne magnetometer survey ever performed, mapping some 85,000 square miles in the Bahamas for five major oil companies.

Sludge Acid Recovery Process

A flexible, low-temperature process for pumpable sludge acid recovery which produces a gas higher in SO_2 content than that of burning pure sulfur was announced by Monsanto Chemical Company. The new continuous process, known as the Monsanto-Ross-Wilde process, was developed during the war. The process is reported to yield over 98 percent of the recoverable sulfuric acid of the sludge feed. Gas leaving the decomposer unit shows a strength of 70-90 percent sulfur dioxide.

Ships Refinery to Italy

Socony-Vacuum Oil Co. has purchased the 2,000-barrel refinery of Pathfinder Petroleum Co., Los Angeles, for reerection at Naples, Italy, by Raffineria di Napoli, S.A. When installed in Naples, the plant there will have a throughput capacity on a skimming basis of 10,000 barrels daily. Crude from fields in the Middle East will be processed.

Present plans are to have the plant ready for operation by February 1949. This will save a great deal of time as compared with the purchase and erection of a new plant.

Texas Gas Prices

Field price of sweet gas averaged 5.22 cents per thousand cubic feet in 1947 according to a recent report of George H. Shepard, Texas state comptroller. In 1946 the price averaged 4.48 cents and in 1945 4.14 cents. Casinghead gas averaged 3.13 cents compared with 2.01 cents in 1945. Sour gas brought 3.13 cents.

Sales volume of sweet gas was 1,334 billion cubic feet in 1947 compared with 1,240 billion cubic feet in 1945. Casinghead gas sales totaled 665 billion cubic feet in 1947 and sour gas sales 258 billion cubic feet, a reduction from the 276 billion cubic feet sold in 1945.

Shell Oil Co. helicopter landing the marsh south of Lake Charles, La. with gravity meter operator. The gravity meter is supported entirely by the tripod betwen the pontoons after the plane lands. The plane motor is stopped while readings are being taken to eliminate effects of vibration. The strong down draft from the helicopter's rotor blades flattens the reeds, permitting the plane to land and take off in virtually impassable country.

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International News and Notes

Dr. Ing. Carlos E. Velarde

Fifty Years In Oil Industry

Dr. Ing. Carlos E. Velarde, vice president of the Argentine section of Instituto Panamericano de Ingenieros de Minas y Geologia and of the directive commission of Instituto Sudamericano del Petroleo, recently celebrated the completion of fifty years of activity in the petroleum industry. He graduated from the Peruvian School of Engineers in 1898 at the age of 20 with the degree of mining engineer, and for several years was engaged in mining and geological work in Peru. In 1913 he went to Argentina as chief of mining inspection in the general mines administration of the Ministry of Agriculture and later became chief of the mining section. Since 1923 he has acted as legal and technical consultant for various mining and oil companies in Argentina. He is the author of numerous reports and articles on various phases of oil and mining.

U. S. Imports-Exports

Imports of crude petroleum and products into the United States during March 1948 are reported by the statistical division of American Petroleum Institute as 15,733,000 barrels or at the rate of 507,000 barrels daily. Exports for the same month were 10,210,000 barrels or an average of 330,000 barrels daily.

Rees Makes Latin America Tour

Earl Rees, export manager for Patterson-Ballagh, is now spending five months in Mexico and South America. He is completing a field study of foreign needs in rubber oil field specialties.

Earl Rees

Argentine-Peruvian Oil Deal

An agreement between the recently established Empresa Petrolera Fiscal of Peru and the IAPI of Argentina provides for the purchase by Peru of wheat up to a value of $20,000,000. Payments for grain shipments are to be placed to the credit of EPF for investment in oil development in Peru, and Argentina's remuneration is to take the form of deliveries of six million barrels of crude or petroleum products over the next four years. The agreement, which is subject to approval by the Peruvian government, includes the establishment of a mixed Peruvian-Argentine company to conduct oil operations.

Named Director

Simon J. Vos, manager of Regent Oil Co., Ltd., and acting managing director of Trinidad Leaseholds Limited, both of London, has been appointed a director of Central Mining & Investment Corp. of London.

Record Production in Venezuela

Venezuela set a new all-time high record for crude oil production on June 28 with an output of 1,353,825 barrels. Production for the month amounted to 40,147,199 barrels, an average of 1,338,240 barrels daily, a gain of 14,858 barrels over the daily average for May. Exports during June were 36,746,601 barrels.

For the first six months of 1948 production was 238,351,818 barrels, an increase of 29,632,156 barrels over the corresponding period of 1947 and 12,431,752 barrels above the total for the second half of that year. Production for the six months January-June 1948 by companies was as follows:

Company	West	East	Total
Creole	87,052,123	28,493,097	115,545,220
Mene Grande	10,929,813	28,354,121	39,283,934
Shell	72,231,453	—	72,231,453
Sinclair	—	3,503,781	3,503,781
Socony	—	5,469,701	5,469,701
Texas	—	1,213,282	1,213,282
S.A.P. Las Mercedes	—	466,258	466,258
B.C.O.	198,251	—	198,251
Orinoco	56,857	—	56,857
Phillips	—	333,829	333,829
Rexco	26,832	—	26,832
Atlantic	—	22,420	22,420
Total Barrels	170,495,329	67,856,489	283,351,818

Oil Advisor to Colombia

Max W. Thornburg, consultant on international oil, has been spending several weeks in Colombia surveying oil industry conditions. He was retained by the Colombian government to advise regarding amendments to the country's oil law. Efforts to revise and modernize the law have been in progress for several years past, as it is generally agreed that its requirements, especially those governing the grant of concessions, have hampered development of the nation's oil resources.

Joins Harland & Wolff

H. R. Humphreys, formerly of Cammell Laird & Co., Ltd., Birkenhead, has been appointed assistant to the general manager, repair works of Harland and Wolff, Ltd., with headquarters at the company's London office.

Leaves Shell After 27 Years

Dr. L. Kehrer has retired as exploration manager of the Caribbean Petroleum Company in Caracas after 27 years of service with Shell companies. Dr. Kehrer was born in Zurich, Switzerland, and obtained his Ph.D. degree in 1920 from the university

Dr. L. Kehrer

there. Since then he has done geological work in Venezuela, Java, Ecuador, Trinidad and at The Hague. Most of these years have been devoted to geological studies in Venezuela where he served as field geologist, was promoted to the position of chief geologist and finally to that of exploration manager. During these years Dr. Kehrer has written many articles on geological studies.

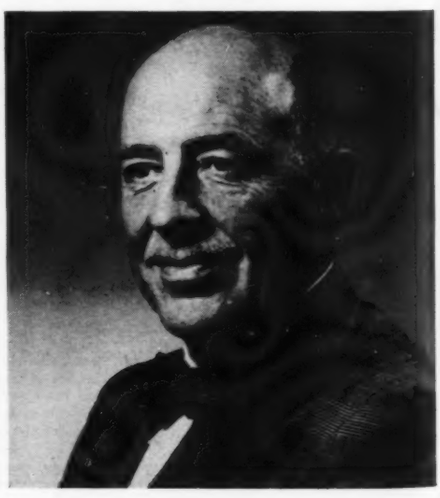
Turkey Has Second Producer

Exploratory tests being conducted by Drilling and Exploration Company for the Turkish government have brought in a second producing well. The well is located on the Ramandag structure in southeastern Turkey near the site of the first discovery. It has been producing on test upward of 500 barrels daily.

R. S. HOMET has been appointed general manager of the foreign trade department of the Socony-Vacuum Oil Co., Inc. F. E. Powell, Jr., continues as chairman of the foreign trade committee, and J. J. Pettey becomes a member of the committee, taking over the position previously held by Mr. Homet. Mr. Pettey will be responsible for the company's operations in Portugal, Spain, West Africa, Spanish Morocco, Canary Islands, Gibraltar and Tangiers.

Philip Clover has been recalled from Europe to become a member of the foreign trade committee, with responsibility for South and Central America, Germany and Austria. J. S. Vesey Brown has been appointed manager of the West Africa division.

R. S. Homet



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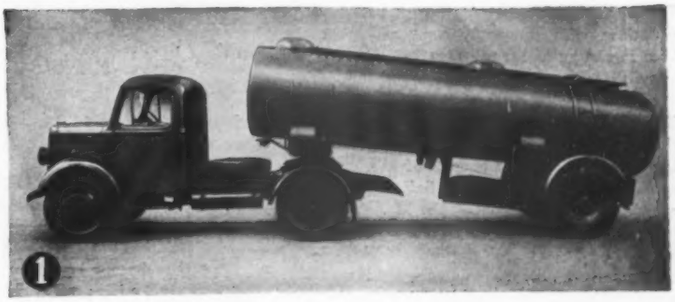

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OIL COMPANY STAFF CHANGES

Stanley R. Wilson

O. C. Schorp

STANLEY R. WILSON has been appointed secretary of Universal Oil Products Co., it is announced by David W. Harris, president. Mr. Wilson was an engineering graduate of the University of Illinois in 1922 and joined Universal the same year. Later he studied law at DePaul University, Chicago. For several years he represented Universal abroad, with headquarters in London. Later as administrative assistant in the Chicago office on contract and financial problems, he continued to handle foreign work. For three years he performed similar duties as administrative assistant in the New York office. During the war Mr. Wilson was in charge of all Universal's contract negotiations with the government and since then has been in charge of the contract department of the company.

RICHARD J. KAUL, former assistant in charge of chemicals to the manager of New Jersey refineries, has been appointed manager of the operations and planning division of the chemical products department of Esso Standard Oil Co. Mr. Kaul has been a member of Esso Standard for 25 years. Named superintendent of the chemical products plant at Balway, N. J., in 1934, he subsequently held several managerial positions.

ALVIN R. SOMMERS, formerly north and west Oklahoma production division superintendent at Oklahoma City for Sunray Oil Corp., has been named Oklahoma division superintendent and will now also be in charge of Sunray's south and central Oklahoma production department operations in the greater Seminole area.

C. C. Shreve, formerly the company's Oklahoma division superintendent for the greater Seminole area, headquartering at Allen, has been transferred to Great Bend, Kansas, where he will be Kansas division superintendent for Sunray. In this capacity he succeeds F. D. Sabourin, resigned. V. L. (Fred) Smith, division engineer at Allen, will take on increased duties as production superintendent in the greater Seminole area.

ARTHUR V. DANNER, formerly executive vice president and director of the Houdry Process Corp., Philadelphia, has returned to the Socony-Vacuum Oil Co. He will be in charge of process promotion. Mr. Danner joined Socony-Vacuum in 1937 and during the war was on loan to the PAW. He became associated with Houdry in 1944.

O. C. SCHORP president of Carter Oil Co., Tulsa, has been elected a trustee of the University of Tulsa. Mr. Schorp was elected by the trustees to serve for a three-year term on the governing body of the school. He also is serving as a member of the board of the University of Oklahoma Foundation at Norman, Oklahoma.

CHARLES K. CLARK has resigned as division geologist for Pure Oil Co. to become chief geologist of Michigan Oil Co., Saginaw, Mich. He assumed his new duties on Sept. 1. Mr. Clark is a member of the Michigan Academy of Science and past president of the Michigan Geological Society. He is business representative of the American Association of Petroleum Geologists in Michigan.

Michigan Oil Co. is a subsidiary of Bay Refining Corp. It is currently extending its exploration and producing activities in Kansas, Michigan and Illinois.

CHARLES E. SPAHR has been elected vice president of the Sohio Pipe Line Co. He has been general assistant to S. H. Elliott, vice president of Standard of Ohio in charge of transportation since 1946. He has been with Sohio since 1939 and previously was with Phillips Petroleum Co. as assistant to the vice president of the engineering department as an economic student of new pipeline projects.

Charles E. Spahr

JOHN M. B. HOWARD has been appointed assistant manager of Standard-Vacuum Oil Company's marine department. Mr. Howard had extensive experience with Jersey Standard's worldwide marine operations prior to joining Standard-Vacuum. He started as a deck officer on tankers in 1933, and his most recent assignment was in London as assistant general manager of Esso Transportation Co., a Jersey Standard affiliate. In his new connection he will assist W. F. Dunning in handling the owned and chartered tankers which fly the "Stanvac" flag throughout the Far East.

D. C. RHODES has been appointed superintendent of a new district established at Freeport, Texas, by Humble Oil & Refining Co. The new district will supervise marine operations off the Texas coast. Thus far one drilling platform has been built six miles offshore and about ten miles southeast of the town of Freeport. Mr. Rhodes has formerly superintendent at North Katy. E. E. Byrd is district petroleum engineer, and D. J. Lewis, district civil engineer.

A. W. ARKINGTON has resigned as assistant treasureu of Bethlehem Supply Co., Tulsa, to become treasurer of Continental Oil Co. He succeeds S. B. Jurenev, who was elected trasurer last May to serve temporarily at the same time R. L. Bosworth, formerly vice president and treasurer, was elected financial vice president of Continental. Mr. Jurenev will continue as secretary and will be manager of the newly created coordinating and planning department.

CHARLES R. BROWN has been appointed a vice president of Tide Water Associated Oil Co. Mr. Brown has served as assistant to the president for many years and is a member of the company's western division operating committees. He will continue his general administrative duties with direct responsibility for many of Tide Water Associated's administrative departments in the western division.

L. L. DAVIS has been appointed manager of Continental Oil Company's newly created development and research department. A pioneer in the development of synthetic additives for use in lubricating oils and in research and development of lubricating greases, Mr. Davis has been associated with Continental for more than 21 years. He has been supervisor of technical services of the company's manufacturing department since 1929.

Mr. Davis' first job in the petroleum industry was in 1917 with the Crew-Levick Oil Co., a Cities Service subsidiary, as a trainee in refinery operations at Warren, Pennsylvania. Later he was with the Pierce Oil Corp. for several years and joined Continental in 1927.

L. L. Davis

A copy of this picture suitable for framing will be sent on request.

ROBERT YARNALL RICHIE

Egypt—the land of ancient civilization and culture, today witnesses an active oil exploration program.

Here, also, Schlumberger has established bases to serve the oil industry . . . *"wherever the drill goes, Schlumberger goes!"*

SCHLUMBERGER OVERSEAS S. A.

P. O. BOX 228, CAIRO, EGYPT

Heads Franks Sales

A. H. Knight has been appointed sales manager of the Franks Manufacturing Corp. of Tulsa. Mr. Knight has spent more than ten years with major supply stores and has had considerable field experience since becoming identified with the petroleum industry in 1929. He was with the Oil Well Supply Co. for eight years and was with the International Derrick and Equipment Co. the past year and one half. In the Navy four years during the war, much of the time overseas, he was discharged with the rank of Lieutenant Commander.

Palmer Named General Manager

Arthur B. Palmer has been appointed general manager of the Sperry-Sun Well Surveying Co. Mr. Palmer joined the parent Sun Oil Company as an engineer at Maracaibo, Venezuela, in 1922. He joined Sperry-Sun as a sales and service engineer in 1929. In 1938 he was named district manager for the company, and since August 1947 he has served as general sales manager with headquarters at Houston, Texas.

George M. Giltinan

George M. Giltinan, 62, a director of Seismograph Service Corp. and an officer of one of its subsidiary companies, died in Victoria Harbor, Ontario, Canada, while on a vacation trip. Mr. Giltinan had been in ill health over a year ago but had made a good recovery and was regularly carrying out his duties in Seismograph Service Corp.

Mr. Giltinan joined Seismograph Service in June, 1933, and has been with the company since then except for two years with Magnolia Petroleum Co. He was elected secretary and director of Seismograph in 1941, a vice president in 1945 and in 1946 was appointed management advisor.

H. L. Cunningham

Ideco Appoints New Advertising Manager

H. L. "Bob" Cunningham, Oklahoma City advertising executive, has recently joined the sales headquarters of the International Derrick & Equipment Co. at Dallas, Texas, as advertising manager. Prior to joining the Ideco group, "Bob" represented an industrial advertising agency in Oklahoma City, handling oil field equipment advertising for manufacturers in Oklahoma, Texas.

D. J. SMITH, president of Pan American Petroleum & Transport Co., has announced the election of six new directors of Paptco's associated operating companies. Dr. H. R. Snow, manager of the company's main refinery at Texas City, Texas, is a director of both Pan American Refining Corp. and Mexican Petroleum Co. of Georgia. A. A. Corona, vice president of Pan American Petroleum & Transport Co., is director of Pan American Production Co. P. J. Sweeny, first vice president of Pan American Refining Corp., has been elected director of Pan American Gas Co. L. W. Moore, general manager of manufacturing, Pan American Refining Corp., has been elected director of Pan American Pipe Line Co. Harold Decker, vice president and director of Pan American Production Co. and Pan American Gas Co., has been elected member of the executive committee for both companies. R. H. Maupin, director of Pan American Pipe Line Co., has been elected member of the executive committee.

A. H. HAYES has been promoted to assistant general superintendent of the Whiting, Ind., refinery of Standard Oil Company (Indiana) to succeed J. C. Ducommun, who became refinery manager July 12. Mr. Hayes joined the company in 1930 as a chemist in the Whiting research laboratory. After serving also in the pressure-still and crude-still departments at the Whiting refinery, he became superintendent of the light oils division at the refinery in 1946.

R. S. BLAZER has been named president of Allied Oil Co., Inc., L. M. Jonassen has been named president of Cleveland Tankers, Inc.; and C. H. Marshall has been named president of Central Pipe Line Co. The three companies will operate as independent subsidiaries of the newly expanded Ashland Oil & Refining Co. Former owners and heads of these companies, F. R. Newman and W. W. Vandeveer, will no longer be identified with the operating management.

HAROLD I. HOOVER has been appointed technical assistant in the products pipeline division of the supply and transportation department of Phillips Petroleum Co. Replacing him as superintendent of the East Chicago, Indiana, terminal is W. E. Staton.

NUMBER 3 IN A SERIES

The "Master" Contract and mechanical engineering time

THE "master" type of contract for refinery modernization and expansion—under which one engineering company takes complete responsibility for all work—nowhere manifests its superiority to greater advantage than in the time-consuming details of mechanical engineering.

First, through confining all engineering within *one* organization it eliminates costly hours spent in coordinating details between several engineering contractors. Further the "master" contract operation eliminates any possibility of expensive job-site alterations when a few of the multitudinous details involved fail to be accurately coordinated among several engineering organizations all working independently.

To get down to a few specifics in the matter of savings through coordination, the "master" contract operation saves time *at the very inception of mechanical engineering*—in the initial problems concerned with the relative locations of the process units, their space and tankage requirements and such provision for future expansion as may be deemed necessary without undue initial investment. The required off-site facilities are usually an important factor in these problems and therefore simultaneous studies must be made of the electric power, steam, fuel gas, water and air distribution systems, all yard oil piping and the various sewers and blowdown systems, before an intelligent decision can be made.

Detailed design of the process units cannot be started until this overall picture has been completed, steam, water and fuel gas pressures and temperatures at the battery limits have been determined, where all incoming and outgoing services and oil and sewer lines should enter and leave each battery limit and their elevations.

All these as well as a veritable host of other important engineering details *must be* integrated between units—not on the basis of greatest ease or economy in the building of any one unit—but on the basis of *overall economy and efficiency of the entire processing plant.*

To obtain such integration to the maximum degree of final efficiency among the various design departments of several engineer-contractors is obviously expecting the impossible from human nature. For it must be borne in mind that each engineer-contractor has developed his organization along lines that suit his particular method of operation. Each has his own particular methods and standards of design, each his own table of specifications. If the impossible is accomplished, it is *still* costly—for since each contractor must wait for information from the other there is time consumed in its accomplishment that could serve either to advance the date of operation of the unit, or lower its cost, or both.

There is still another major overall advantage of the "master" contract operation—beyond the actual dollars-and-cents savings in engineering time. This is in the *uniformity of engineering specifications*—when all work at the job site is handled by *one concern.* Such uniformity results in reduced construction costs since all buildings and structures will be of uniform basic design. Furthermore, such uniformity results in reduced maintenance costs and a smaller spare parts inventory, neither being an inconsequential consideration in these days when maintenance costs are a major factor in establishing processing profits.

by
O. G. PRATT
In Charge of Mechanical Engineering
The M. W. Kellogg Company

Our company—M. W. Kellogg—is completely staffed and equipped for refinery and chemical plant design and construction, from the step of laboratory research through the initial operation of completed plants. It periodically issues a publication called the KELLOGGRAM, which describes many of these services. If you are not already receiving it, we will be glad to add your name to the list if you will drop us a line at 225 Broadway, New York 7, N. Y.

A SUBSIDIARY OF PULLMAN, INC.

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

To Sell Rochester Ropes

Houston Oil Field Material Co., Inc., henceforth will be distributor for Rochester Wire throughout the oil country. Homco, which has 24 stores in Louisiana, Mississippi, New Mexico, Oklahoma and Texas, will handle Rochester rope at every outlet. The Rochester line includes Rochester "wirelon," the nylon-covered wire rope recently introduced by Rochester.

Refinery Supply Opens New Warehouse

W. A. Schlueter, president of The Refinery Supply Co., Tulsa, has announced the completion of a new warehouse, adding over five thousand square feet of floor space to storage. This new building is now completely stocked. The additional investment is well over $100,000. Future plans contemplate extending the main building down Fourth Street east to the corner. It would be used exclusively for the manufacture of the new R. S. Liquid Recording Gravitometer. Also it is planned to use the small building, in the center of the picture, as a company cafeteria.

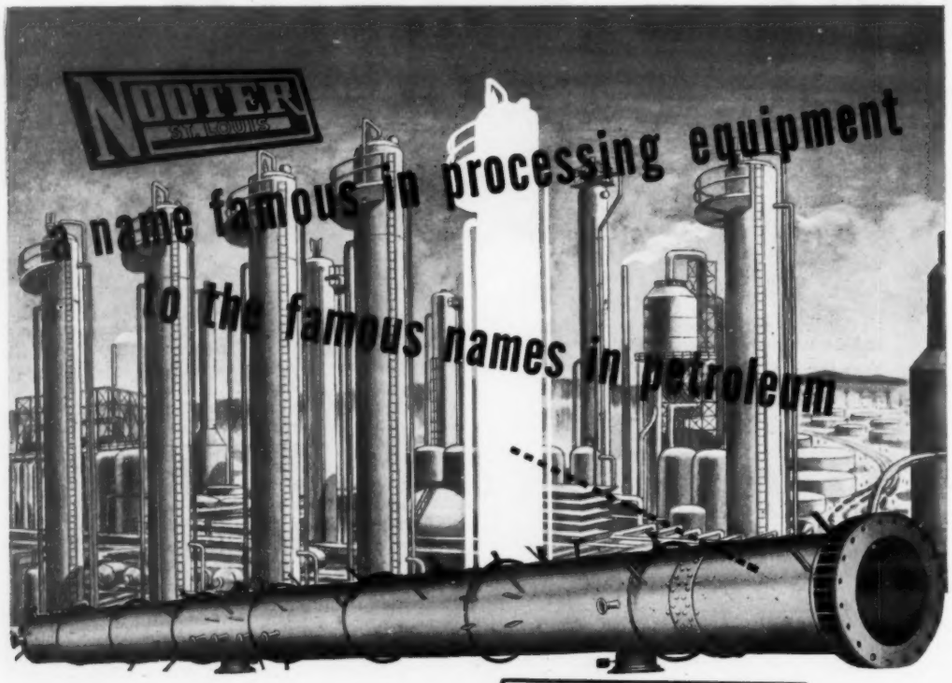
The Refinery Supply Co. has been designing and manufacturing laboratory and gas testing equipment for the oil industry since 1918. The first control application ever designed for vapor outlet control towers was covered by applications of Mr. Schlueter, made on March 6, 1918.

Chicago Bridge Lets Contract

The Chicago Bridge & Iron Company has let a contract to the American Bridge Company for an outside crane runway and shop building No. 2 at its new Salt Lake City, Utah, fabricating plant. Tanks and steel plate work are being fabricated in shop No. 1 which was completed in June.

When shop No. 2 is complete in 1949, the new Salt Lake City plant will be a completely integrated unit with facilities for fabricating practically all of the company's devirsified line of products. Shop No. 1 is equipped to frabricate flat-bottom tanks, Horton floating roofs, reservoirs and other structures of this same general type. Shop No. 2 will be equipped to fabricate Hortonspheres, Hortonspheroids, Hemispheroids, Water spheres, Vaporspheres, elevated tanks and other similar structures.

The new Chicago Bridge & Iron Company plant is located at 550 West 17th South Street, in Salt Lake City. A. N. Hopper, formerly chief draftsman for the company at its Greenville, Pa., plant, is manager of the Salt Lake City plant.



Fractionating Tower of Silicon Bronze, 3' 6" ID, 80' high, ¼" to ⅞" varying thicknesses, with X Ray tested welds — entirely fabricated by Nooter.

To the large and the small—Nooter is a name that has always been associated with long, dependable service.

One of the world's finest and most complete equipped plants, Nooter offers every advanced technique and modern facility to assure more dependable, safer fabrication. Nooter Dura-Pure Welds meet all API and ASME Code specifications—and the latest testing, stress relieving, and X-Ray equipment are at your service to guarantee flawless construction.

More than half a century of experienced craftsmanship backs the Nooter guarantee of superior fabrications. Experienced metallurgical specialists who know the properties and behavior of metals and alloys protect the quality of your fabrication through every phase of production.

Depend on Nooter—whenever you need refining and processing equipment fabricated to your specifications.

Agitator Tanks • Condensers • Coolers • Distillation Equipment • Ducts Evaporators • Extractors • Fractionating Equipment • Heat Exchangers • Pressure Vessels • Separators • Jacketed Vessels • Vacuum Tanks • Treating Tanks

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Send for bulletin on the advantages of Nooter fabrications.

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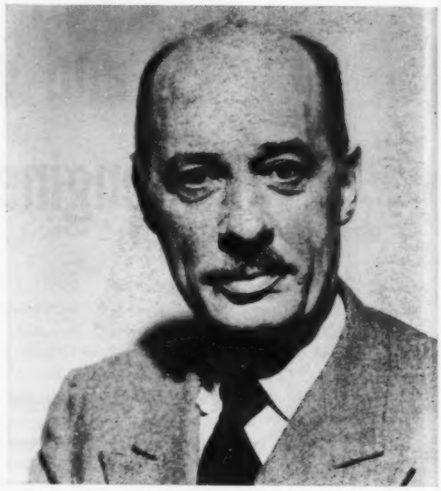

Eugene J. Houdry

Houdry to be Honored

Eugene J. Houdry will receive a 1948 Potts Medal from The Franklin Institute in recognition of his leadership in the development of catalytic cracking of petroleum. Presentation will be in Philadelphia, October 20.

Mr. Houdry was originally attracted to problems of motor fuels through an interest in automobile racing. For several years after World War I, he led efforts in France to manufacture gasoline from lignite and coal by a process involving catalysis invented by a pharmacist named Prudhomme. These attempts proved unsuccessful commercially. In 1926 he began his own experiments in catalytic cracking and came to the United States in 1930 to continue development of his process with the aid of the Socony-Vacuum Oil Co. and Sun Oil Co. During the nearly part of World War II Houdry catalytic cracking units supplied 90 percent of all the aviation gasoline base stock made in this country.

Heads Witte Engine Sales

M. E. Nicklin, manager of Oil Well Supply Company's export division since March, 1940, has been appointed manager of sales for the company's Witte Engine Works at Kansas City, Mo. M. E. Keenan, assistant manager of the export division, with headquarters in New York City, was named to succeed Mr. Nicklin. Mr. Keenan was transferred to the export division in New York in 1942 as assistant to the division manager.

JOSEPH S. OPPE of New York, has been appointed chief of the tanker branch of the Transportation Division of the Economic Cooperation Administration. He was assistant director of the tanker division of the United States Maritime Commission and the War Shipping Administration during the war. He was previously with the Gulf Oil Corp.'s marine department in New York City.

W. Philip Cox

Cox Opens Consultant Office

W. Philip Cox has resigned from the producing department, Socony-Vacuum Oil Co., Inc., New York, and has opened offices in the Shoreham Bldg., Washington, D. C., as a petroleum engineering and government relations consultant to oil operators and equipment manufacturers.

Mr. Cox, a graduate petroleum engineer, has been in charge of materials operations for Socony since World War II. Prior to the war he was with the Gulf Oil organization in California and Venezuela as a petroleum engineer and superintendent of drilling and production. A reserve officer in the Army, he was called to active duty in 1941 and assigned to the General Staff. In 1942 he joined the staff of the Foreign Division of the Petroleum Administration for War, where he was in charge of foreign materials programming, priorities and export license operations until his resignation in 1944 to reenter industry.

Appointed Core Lab Sales Manager

W. E. Stiles, former Gulf Coast division manager in Houston for Core Laboratories, Inc., has been recently promoted to manager of sales. Mr. Stiles, a graduate petroleum engineer from Texas A & M College, was employed by Core Lab in 1942 as a field engineer specializing in field testing work. During the past six years he has held positions as reservoir engineer in the engineering department and as division engineer of the north Texas division. Prior to his association with Core Lab, he was engaged in coring equipment sales and service and subsurface engineering work. In his new capacity Mr. Stiles will direct the company's entire domestic and foreign sales program from the general office in Dallas.

W. E. Stiles

To Build LPG Terminals

Warren Petroleum Corp. has started construction of four large LPG storage terminals at strategic points in its marketing territory as a part of its program to conserve seasonal excess production for ready distribution in periods when current output is inadequate to meet peak demand. The four terminals will have a combined capacity of 4,800,000 gallons and bring total storage capacity at Warren terminals to 12,500,000 gallons. The new terminals will be at Mobile, Ala.; Little Rock, Ark.; Des Moines and Cedar Rapids, Iowa. All four will be ready for use before the usual winter peak demand period arrives.

"These terminals are one producer's share of the storage that the entire industry — producers, distributors and consumers—need and must have if we are to wipe out our seasonal periods of feast and famine," G. L. Brennan, general manager of Warren's LPG division explained. Warren recently built large terminal installations at Norsworthy, Texas, and Newark, N. J., for use in connection with the propane tanker, "Natalie O. Warren."

The fact that Warren is the first LPG manufacturer and marketer to invest in large scale storage of this type is not surprising when it is recalled that the company also pioneered large scale terminal storage to absorb and conserve excess natural gasoline production back in the days when manufacturers of that product were experiencing seasonal periods of production in excess of demand, and then demand in excess of current production.

RUST
Red Lead and Graphite finely ground in an oil varnish medium is "R.L.G" — the perfect rust inhibitor.
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Oil Development in Colombia Needs New Incentives

(Continued from page 80)

standpoint the net result has been the discovery of eleven oil fields and a peak oil production of 70,000 barrels per day.

Colombian governments always have shown a keen interest in laws which would promote the oil development of the country. Wildcatting, a greater oil exploitation and the subsequent economic and social benefits accruing to Colombia, it is generally agreed, are a function not only of the provisions and interpretation of the oil law, but of the laws governing management-labor relations and the tax statutes, particularly the income tax law.

Attempts have been made and are still in progress to modify if not to rewrite Colombia's basic oil law which, it is agreed, is a workable instrument, requiring certain modifications to improve it. The proposed oil law changes represent a sincere effort on the part of the government to promote oil developments in the country. It is recognized that whatever changes are made must be in the direction of making capital investment more attractive. In keeping with worldwide oil developments and in view of the discovery and production record reviewed, provisions of a new oil law giving management guarantees with respect to strikes and labor demands, together with much needed income tax modifications, are essential to maintain incentives for continuing oil exploratory activities. With proper legal measures to adjust certain oil, labor and tax situations and with the favorable price structure in the world crude oil market, the outlook for Colombian oil will be promising.

Table 6

How Oil Dollars Maintain a Favorable Balance of Trade for Colombia

Data from the Exchange Control Office 1944-1947

Year	Dollar Sums Sold to Bank of Republic by oil companies	Dollar Proceeds from sale of coffee abroad	Percent oil compared to coffee dollars brought to Colombia
1944	$ 20,116,000	$ 94,143,292	21.4%
1945	31,929,755	104,547,919	30.5%
1946	33,231,000	156,686,845	21.2%
1947	37,200,000	196,497,321	19.0%
Total	$122,476,755	$551,875,377	22.3%

REFINERY VESSELS

- BUBBLE TOWERS
- PRESSURE VESSELS
- SCRUBBERS
- DRUMS
- STORAGE
- ABSORBERS

An Extra Measure of Quality — All Around QUALITY Found in Material, Design and Craftsmanship of the Finished Fabrication That Rolls From the McNamar Plant, Continues to Bring Forth Expressions of Satisfaction and Appreciation From Men Who Know McNamar Vessels. In Refining Operations, You will Find Hundreds of McNamar Pressure Vessels Serving Efficiently After Many, Many Years of Steady Use.

McNamar's NEW BUBBLE CAP

PREVENTS SLOT CLOGGING

PROVIDES AN EVEN DISTRIBUTION OF GAS!

NEW SERRATED BUBBLE-CAP

THIS NEW, SERRATED BUBBLE CAP WAS SHOWN IN OPERATION INSIDE A MINIATURE TOWER AT THE RECENT WORLD OIL SHOW IN TULSA. McNAMAR'S EXCLUSIVE SERRATED BUBBLE-CAP COMPLETELY ELIMINATES CLOGGING OR STOPPING-UP OF THE SLOTS, A PROBLEM THAT OCCURS SO OFTEN WITH CONVENTIONAL-TYPE BUBBLE CAPS, DURING THE OPERATION OF THE TOWER. GAS IN DISTRIBUTED BELOW THE SURFACE OF LIQUID AND IS FORCED DOWNWARD, THUS HOLDING THE GASES IN THE LIQUID. THIS ELIMINATES ANY POSSIBILITY OF CHANNELING. THROUGH AN EVEN DISTRIBUTION, PLUS AGITATION, A MAXIMUM CONTACT, OR BLEND, IS ASSURED.

LET US TELL YOU MORE ABOUT THIS GREAT, NEW DESIGN.

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Ernest D. Peabody

Honorary Degree

Stevens Institute of Technology conferred the Degree of Doctor of Engineering, Honoris Causa, upon Ernest H. Peabody, president and founder of Peabody Engineering Corp., at the recent commencement exercises. Dr. Peabody introduced the first combined gas and oil burner that permitted the economical and efficient burning of either gas or oil together or singly. He invented and perfected the wide-range mechanical atomizing fuel-oil burner, the combined pulverized coal and oil burner and later produced the first combined burner for liquid gases and pulverized fuels. Dr. Peabody has been quite active in the last several years on extensive research programs in furnace design and combustion on behalf of the United States Navy and one of the major manufacturers of airplane gas turbines.

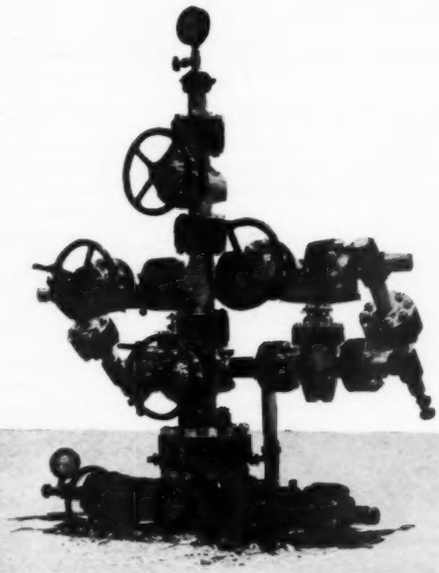
To Install Houdry Plant

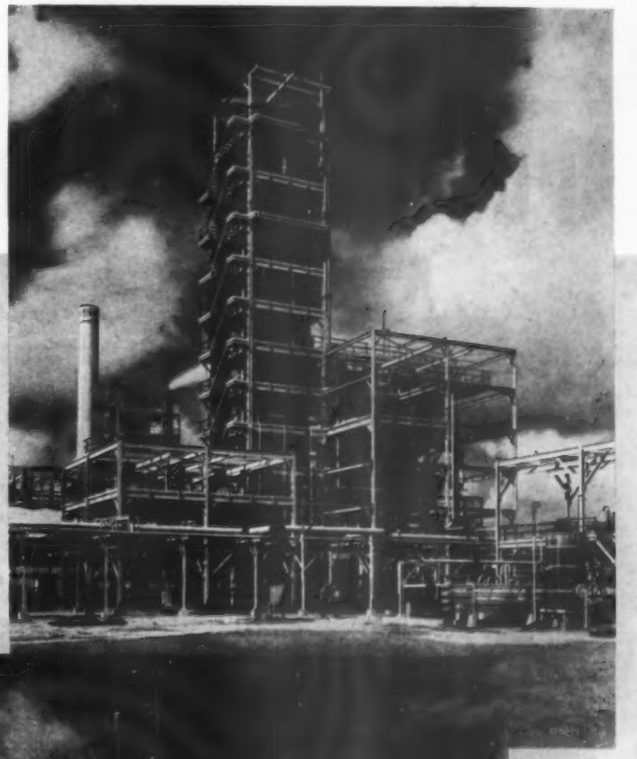
Tide Water Associated Oil Co. will install a Thermofor catalytic cracking unit at its Drumright, Okla., refinery. Signing of contracts with Houdry Process Corp. as licensor and with Process Engineers, Inc., Dallas, as contractors was announced by E. H. Salrin, vice president of Tide Water's mid-continent division.

The TCC unit is designed to charge 4,500 barrels daily with additional capacity up to 6,750 barrels daily for recycling. One of the cat cracker's important design features is its ability to handle either Oklahoma gas oils or high sulfur West Texas gas oils as charge stocks. The plant will be constructed of new materials, and the construction contracts include a gas recovery plant and auxiliary facilities.

FROM WELL HEAD to FINISHED PRODUCTS

Our work for the process industries includes engineering design and construction of a wide range of installations for natural gas, refining and chemical operations from well head to finished products.





STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Heavy Fuel Oil from Coal

The current short supply of heavy oil from petroleum refining has stimulated a search for supplementary sources of supply. Bituminous and subbituminous coal can be easily converted into an oil which may be readily burned in existing equipment. The Bureau of Mines, Office of Synthetic Liquid Fuels, has made a study of the possible methods and has selected two for comparative purposes: direct hydrogenation and a combination of hydrogenation and extraction. The makeup hydrogen is produced either by gasification of coal or by low temperature separation from coke oven gas.

Estimated material quantities and operating costs have been computed. They indicate that the cost of producing a fuel oil suitable for industrial use from coal is not much more than the prices paid for petroleum residual fuel oils during the past year. The authors believe that such plants will be economically practical in the near future, if the present trend of prices for petroleum residual fuel oils continues.

Correction

Among the features of the June number of this magazine was an article based on a very full and technically informative report on Peruvian oil by the eminent consulting geologist, Dr. J. E. Rassmuss, of Lima, Peru. In the process of condensation to bring the contents of the report within the limits of a magazine article, some statistical errors crept in. For example, the estimation of reserves of Lobitos field was stated as about equal to the past production of 85 million barrels. The figure should have been 65 million. Zorritos production was given as about 300 barrels daily instead of the correct figure of 30-40 barrels. Cumulative production of Ganso Azul was placed at 500,000 instead of the correct figure of 400,000 barrels. On page 41 omission of a line from the text made it appear that Agua Caliente and Chonta were related groups of shales instead of entirely separate formations, and the titles on adjoining illustrations of Ganso Azul and Santa Clara areas were transposed.

Two Vice Presidents Elected

W. M. Barnes Co., Los Angeles, has elected John E. Ford, Jr., and J. S. Reynolds as vice presidents. Mr. Ford will be in charge of engineering and sales, and Mr. Reynolds in charge of construction. Both have had many years' experience in the refinery construction and engineering field.

Process Design Division Organized

United Engineers and Constructors, Inc., Philadelphia, has organized a process design division and has placed on its staff a group of engineers with oil company experience, including Gerald L. Eaton, Gordon J. Robertson, Thomas G. Reynolds, E. A. Adler and A. J. Erlacher.

Britain as a World Oil Center

Members of the Council of British Manufacturers of Petroleum Equipment, at a recent meeting in Birmingham, heard Col. S, J. M. Auld, of the Vacuum Oil Co. and D. A. Williams of the Shell Petroleum Co. stress the opportunity available to British industry through the changing position in the oil world since, thanks to the growing importance of the Middle East oil fields, the center of gravity is moving from the western to the eastern hemisphere.

Col. Auld said that British oil production must meet domestic demand requirements of the Commonwealth and the sterling area and at the same time sell oil back into the dollar areas. Today there are only two areas in the world which are net exporters of oil, Venezuela and the Middle East,, and it is of considerable interest and significance that the United States is turning to synthesis of oil from natural gas and from coal, while giving consideration also to production from shale.

Three years ago production from the Middle East was some 34 million tons; in 1948 it is estimated it will be at least 45 million tons. and Col. Auld believes that in 1951 it is likely to be double that figure or nearly one-quarter of world production. Three years ago the proportion of European requirements met from the Middle East oil sources was 15 percent; by 1951 it is likely to be in the neighborhood of 80 percent, which means that the active oil center of the world is moving into Europe. Only a few countries can handle this influx of oil, develop the products, provide the necessary refining and distribution, and this country, suggested Col. Auld, "is the natural place for the new center."

Col. Auld reviewed the vast refinery construction program in the Orient, the Middle East and in Europe. He suggested that half of the 600,000 barrels of daily capacity to be built in Europe will be built in Britain and stressed the vast amount of equipment which will be required.

Mr. Williams amplified the remarks of Col. Auld and told the equipment manufacturers of the importance of getting equipment to the right place at the right time. He complained that last year only about half of the £40 million of equipment ordered was on time at destination. He said that British industry has a great current opportunity to build a permanent export trade in oil equipment. To do this they should know the oil man's problems, and he recommended that the manufacturers go out into the foreign fields to study these problems as a background for proper design. Production of catalogs and instruction booklets in simple terms was urged.

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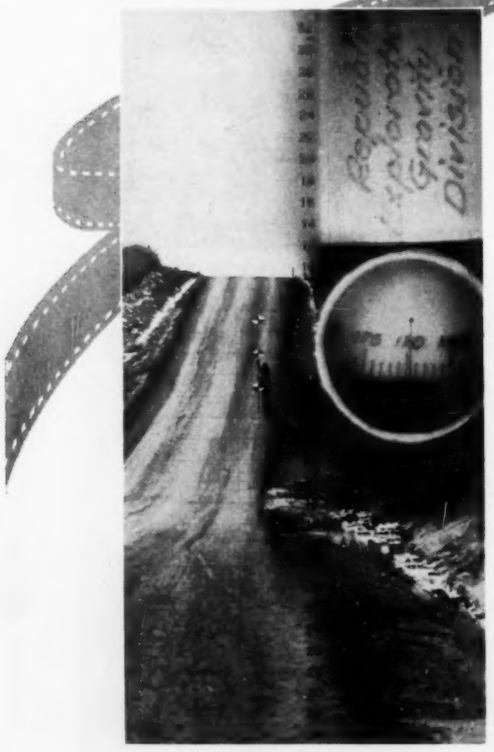

In a consistent effort towards greater accuracy in the field of oil exploration Republic's photogravity mapping service is another step forward.

Photogrammetry Mapping, as the term implies, is the utilization of the principles of photogrammetry in mapping the earth's topography and gravitational field by use of the topographic camera. This method greatly reduces the human error in field operations by permanently recording the exact instrument data necessary.

Photogrammetry, like all Republic services, is offered in the interests of greater efficiency and economy in the science of geophysics.

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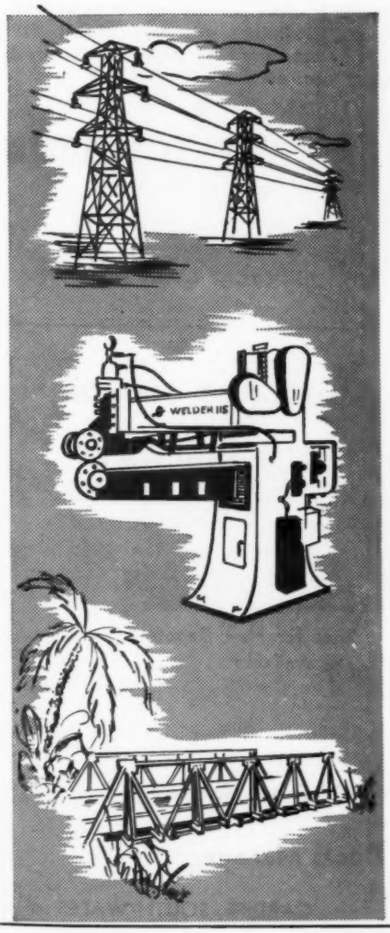

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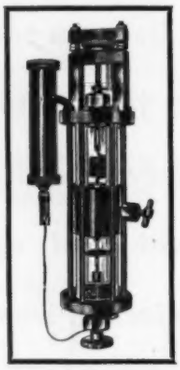
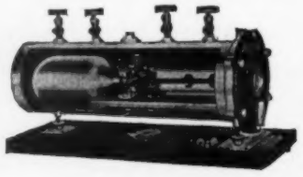
The "Pulsameter" is an instrument for measuring the differential pulsation amplitude across an orifice meter. Where orifice meters are located near Compressor stations, pulsations are usually



present. The magnitude of these pulsations depends on local conditions — number and kind of compressors, piping layout, etc. The "Pulsameter" can be connected to the orifice meter gauge piping and for the condition of measurement the maximum differential pulsation amplitude and recorded differential reading on the orifice meter are determined. From this information the accuracy of the orifice meter under the pulsating condition is indicated.

This testing equipment is used in connection with gas measurement by orifice meter.

GAS GRAVITY BALANCE



Gives dependable and accurate results on wet gas, dry natural gas and artificial gas. In determining the specific gravity of gas, will give results that can be checked within 3 points in the fourth place.

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Petroleum Economy in a Changing World

(Continued from page 73)

Such a multilateral agreement now appears as distant as the stars and is receiving no serious consideration in any circles by government, industry or United Nations.

Of more immediate value and practicality would be a western hemisphere agreement on equitable conditions for oil development. Surprisingly enough in view of hemispheric defense urgencies, this is not under consideration. Petroleum problems are not even scheduled for discussion at the forthcoming economic conference of American Republics in Buenos Aires. Nor have any bilateral petroleum conversions been planned with our sister republics.

The American oil industry has been under repeated investigation during the past few years by Congressional committees, spurred by fears of fuel and gasoline shortages. The millions of words of expert testimony from every source have made it apparent that we must look outside our own borders for solution of some of our basic problems if we are to meet the critical period of the next few years.

However, neither Congress nor the executive branch of the government has taken any steps to formulate in collaboration with industry a program of procedure. The danger of such inaction is a threat to the American industry itself of federal controls being imposed, supposedly to alleviate the domestic situation if it deteriorates any further. Which would be in the class of curing a cold by cutting off the patient's head.

Returning to the basic ingredients of the world oil situation which make the long-range picture a more encouraging one—these short-term perils and pitfalls are the stimuli and pressures which goad us on, in spite of ourselves, to attempt to achieve the goal of world oil being made available in ample quantities to its two billion stockholders for their peaceful progress and development.

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Colombian Oil Statistics

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British Railways (Western Region) Docks CARDIFF, SOUTH WALES

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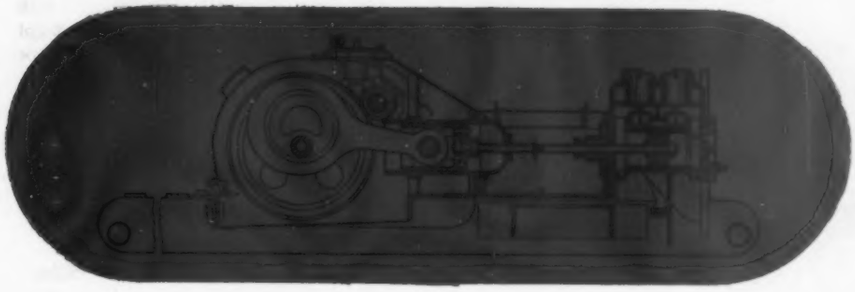
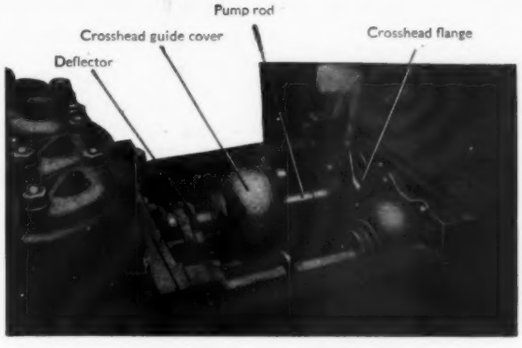
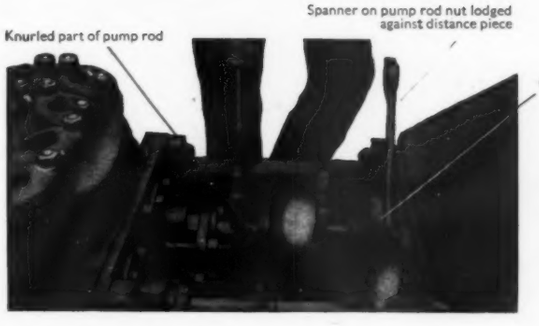


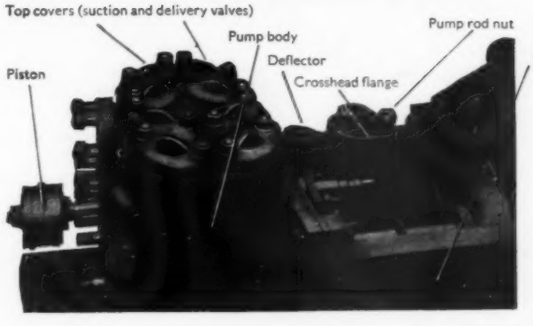


Removal of pump rods from Hayward-Tyler 5" x 6" Oil Country Pump

Crosshead guide cover released and slid along pump rod. Picture shows removal of set screws holding crosshead flange.



Pump rod with crosshead flange attached has been partially withdrawn. With Stilson Wrench on knurled part of pump rod and spanner on pump rod nut, the rod is unscrewed from the nut to release the crosshead flange.



Crosshead flange removed. Pump end cover removed and piston and rod partially withdrawn. Piston and pump rod will now slide right out.

HAYWARD-TYLER

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Will Enlarge Ponca City Plant

Continental Oil Company plans to enlarge its refinery at Ponca City, Oklahoma, at an estimated cost of $7,750,000 according to an announcement by H. G. Osborn, vice president in charge of manufacturing. Construction will start immediately and will require about 18 months for completion. The project will increase the processing capacity of the refinery from 33,500 to 52,500 barrels daily and will make the Ponca City plant the largest in Oklahoma and one of the largest in the southwest.

Main feature in the enlargement will be the installation of a crude topping unit of 30,000-barrel capacity, containing full alloy protection to permit processing of west Texas crude. Other improvements will include installation of a new unit for treating gasoline, complete refinery pipeline and tankage rearrangement, new gasoline and gas recovery facilities and repair and modernization of the TCC unit recently acquired from the government.

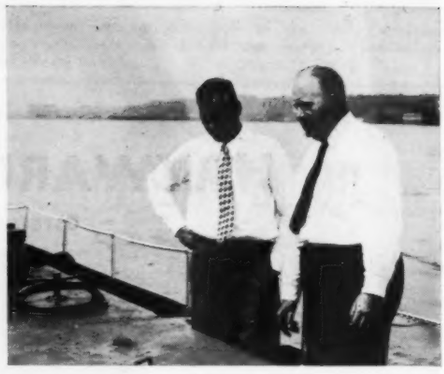
New Book on Oil Fields

Structure of Typical American Oil Fields, Vol. III. Edited by J. V. Howell; published by American Association of Petroleum Geologists, Tulsa, Okla. 516 pages with 13 large maps; $4.50.

This imposing volume is the third of a Structure Series sponsored by the AAPG. No. 1 relates to gas fields and No. 2 to stratigraphic type fields. In the present volume an effort has been made to include fields that are in some way unusual, either in size, type of structure, discovery method, location or other feature of significance. Of the 24 fields here under consideration, 18 have not been previously described except in brief discussion. Each field is treated by an author thoroughly familiar with it. A study of these varied types should be of help in the search for unusual as well as the commonplace types of oil pools. They are hints that many unorthodox traps are awaiting the imaginative petroleum geologist. This volume is a memorial to the late Alexander Watts McCoy.

Cat Cracker on Stream

Standard Oil Co. of Indiana now is operating its new 25,000-barrel fluid cat cracker at Sugar Creek, Mo. The unit went on stream early in August. At dedication ceremonies Standard entertained Kansas City civic leaders on a tour of the plant Aug. 12. Construction of the Sugar Creek unit was begun in January 1946.



Frederic R. Pratt, manager of the marine transportation department, of the Socony-Vacuum Oil Co., Inc., and William B. Jupp, head of the department's construction and repair, inspect the ROCHESTER SOCONY as the remodeled power barge moves up the Hudson River during trial runs.

Synthesis Plant Discontinued

Stanolind Oil & Gas Co. has discontinued the hydrocarbon synthesis plant which was to have been built at Garden City, Kansas, to produce liquid hydrocarbons and hydrogenated compounds from natural gas. Since the plan was announced two years ago construction costs have more than doubled, and it was this increase in costs which caused abandonment of the project.

Carthage Hydrocol, Inc., subsequently announced that it is proceeding with the synthesis plant now under construction at Brownsville, Texas, and that Stanolind will erect the chemicals plant planned in connection with the synthetic gasoline plant. Stanolind also announced that its present natural gasoline plant construction plans have not been altered.

Indian Oil Policy Announced

News of the Indian government's policy as to future petroleum exploration in India has been given this week. According to New Delhi reports received in London, "A certificate of approval of exploring, prospecting or mining license shall be granted only to a person who is an Indian subject" (or, in the case of a company or firm,) "only if such company or firm is shown, to the satisfaction of the government, to be controlled by Indian subjects alone, or with foreign subjects, and registered, incorporated and established in India with rupee capital." Proportions of the latter subscribed in India shall be "not below 51 percent, with proportional representations of Indians in the directorate."

GLEN H. BOWES, assistant region geologist for Continental Oil Co. at Los Angeles, has been made manager of the exploration department of the Hudson's Bay Oil and Gas Company, Ltd., an affiliate of Continental. Hudson's Bay maintains headquarters at Calgary and Winnipeg, Canada, and has extensive holdings in the Turner Valley, Leduc, Lloydminster and Viking-Kinsella fields of Canada, as well as large areas of unexplored acreage upon which it is conducting a vigorous exploratory campaign.

J. W. LOY has been appointed general superintendent of refining operations for Phillips Petroleum Co. in northwestern states. He has been manager of the refining department of Wasatch Oil Co. during the past year.

MARC F. BRAECKEL, vice president and general sales manager of the Richfield Oil Corporation of New York, has been elected president. He succeeds W. Chalmers Burns who has retired. Mr. Burns has been president since 1935. Mr. Braeckel came to Richfield in 1930 and has been a vice president since March 1, 1945.

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New Book

Review of Petroleum Geology, 1947, by F. M. Van Tuyl, W. S. Levings, L. W. LeRoy and others. Published 1948 by Colorado School of Mines, Golden, Col.; 334 pages, $3.00.

This sixth annual review, published in the Quarterly of the Colorado School of Mines in collaboration with the American Association of Petroleum Geologists, presents information compiled from the literature and from a canvass of leaders in petroleum exploration in the United States and foreign countries. Covered are important events of the year, advances in petroleum geology and contributory fields, including developments in the training of geologists and geophysicists, progress in the developments in geophysics and geochemistry, developments in petroleum engineering, aerial photographs, new and improved techniques, world exploration and development, production and reserves, trends in petroleum geology and geophysics and the future of the petroleum industry. A bibliography of about 3,500 listings is included.

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Flame Thrower Fuel Application

Esso Standard Oil Co. is applying diesel fuel thickened with aluminum soap as a fuel igniter for stoker-fed industrial boilers. Full operating steam pressure has been obtained in 30 minutes compared with eight hours usually required by wood and coal kindling. Small quantities burn slowly and with sufficient intensity to fire the coal.

New Shell Chemical Plant On Stream

Shell Chemical Corporation's new plant for the manufacture of methyl ethyl ketone and secondary butyl alcohol is now on stream at Houston, and the synthetic glycerine plant is nearing completion. The third of its type to be brought on stream by Shell Chemical, the newly-completed plant will increase the firm's capacity for these products by 150 percent. The unit is part of a $43 million expansion program undertaken by the company in 1946.

Sale of Mexican Oil

Announcement was made in Mexico City by Petroleos Mexicanos on August 16 of the conclusion of a contract for the sale of 9,800,000 barrels of Mexican oil to Sinclair Oil Company. Delivery of the oil is to extend over 1949-50, a portion of the shipments going to Cuba and the larger part to the Sinclair refinery near Philadelphia.

Plan New British Refinery

Anglo-Iranian Oil Co. and Gulf Oil Corp., partners in development of Kuwait oil fields, are planning the erection of a British refinery of some 80,000 barrels daily capacity. Location will be in Kent on the Isle of Grain, according to present plans which await government approval. Cost of the plant is estimated at $120 million.

Rear Admiral H. B. Miller

REAR ADMIRAL HAROLD BLAINE MILLER, U.S.N. (ret.) has been appointed director of the department of information of the American Petroleum Institute. Formerly public relations officer for Fleet Admiral Nimitz in the Pacific area, Admiral Miller later was assigned to the Navy Department in Washington as director of public information. He retired in 1946.

In addition to functioning as the director of the API's department of information, Admiral Miller will, by request of the Oil Industry Information Committee, of which Ralph C. Champlin, of Ethyl Corporation, is chairman, serve as executive officer of that committee which is conducting the information program for the entire oil industry. Robert E. Allen will continue with the Institute as assistant director of the department of information.

BASIL P. KANTZER has been appointed manager of field operations for Union Oil Co. of California, to succeed W. J. Larson, resigned. Mr. Kantzer has been chief production engineer for the company since 1943.

DEREK ALAN HOUGH appointed general secretary of the Institute of Petroleum September 1. George Sell has been appointed editor of the Institute's publications with effect from August 1. Mr. Sell has been publications secretary since March, 1946.

C. C. TATE has been appointed assistant manager of the refining department of Phillips Petroleum Co., Bartlesville, Okla. He will continue to supervise the Petroleos Mexicanos project of which he has been in direct charge since 1945 but will transfer his headquarters from Mexico City to Bartlesville.

ALEX H. CHAPMAN has been appointed assistant to James Terry Duce, vice president of Arabian American Oil Co. Mr. Chapman formerly was a consultant for Trading and Shipping, Inc., and at one time was vice president of Hoover, Curtice and Ruby.

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